Fish Assemblage Surveys of the Lower Thames River, Ontario, Using Multiple Gear Types: 2003 - 2004

A. Edwards and N.E. Mandrak

Fisheries and Oceans Canada
Great Lakes Laboratory for Fisheries and Aquatic Sciences
867 Lakeshore Rd. P.O. Box 5050
Burlington ON L7R 4A6 CANADA

2006

Canadian Manuscript Report of Fisheries and Aquatic Sciences 2772

Fisheries and Oceans Canada Pêches et Océans Canada

Canada

Canadian Manuscript Report of Fisheries and Aquatic Sciences

Manuscript reports contain scientific and technical information that contributes to existing knowledge but which deals with national or regional problems. Distribution is restricted to institutions or individuals located in particular regions of Canada. However, no restriction is placed on subject matter, and the series reflects the broad interests and policies of Fisheries and Oceans Canada, namely, fisheries and aquatic sciences.

Manuscript reports may be cited as full publications. The correct citation appears above the abstract of each report. Each report is abstracted in the data base *Aquatic Sciences and Fisheries Abstracts*.

Manuscript reports are produced regionally but are numbered nationally. Requests for individual reports will be filled by the issuing establishment listed on the front cover and title page.

Numbers 1-900 in this series were issued as Manuscript Reports (Biological Series) of the Biological Board of Canada, and subsequent to 1937 when the name of the Board was changed by Act of Parliament, as Manuscript Reports (Biological Series) of the Fisheries Research Board of Canada. Numbers 1426 - 1550 were issued as Department of Fisheries and Environment, Fisheries and Marine Service Manuscript Reports. The current series name was changed with report number 1551.

Rapport manuscrit canadien des sciences halieutiques et aquatiques

Les rapports manuscrits contiennent des renseignements scientifiques et techniques qui constituent une contribution aux connaissances actuelles, mais qui traitent de problèmes nationaux ou régionaux. La distribution en est limitée aux organismes et aux personnes de régions particulières du Canada. Il n'y a aucune restriction quant au sujet; de fait, la série reflète la vaste gamme des intérêts et des politiques de Pêches et Océans Canada, c'est-à-dire les sciences halieutiques et aquatiques.

Les rapports manuscrits peuvent être cités comme des publications à part entière. Le titre exact figure au-dessus du résumé de chaque rapport. Les rapports manuscrits sont résumés dans la base de données *Résumés des sciences aquatiques et halieutiques.*

Les rapports manuscrits sont produits à l'échelon régional, mais numérotés à l'échelon national. Les demandes de rapports seront satisfaites par l'établissement auteur dont le nom figure sur la couverture et la page du titre.

Les numéros 1 à 900 de cette série ont été publiés à titre de Manuscrits (série biologique) de l'Office de biologie du Canada, et après le changement de la désignation de cet organisme par décret du Parlement, en 1937, ont été classés comme Manuscrits (série biologique) de l'Office des recherches sur les pêcheries du Canada. Les numéros 901 à 1425 ont été publiés à titre de Rapports manuscrits de l'Office des recherches sur les pêcheries du Canada. Les numéros 1426 à 1550 sont parus à titre de Rapports manuscrits du Service des pêches et de la mer, ministère des Pêches et de l'Environnement. Le nom actuel de la série a été établi lors de la parution du numéro 1551.

Canadian Manuscript Report
of Fisheries and Aquatic Sciences 2772

2006

Fish Assemblage Surveys of the Lower Thames River, Ontario, Using Multiple Gear Types: 2003 – 2004

By

Amy Edwards and Nicholas E. Mandrak

Great Lakes Laboratory for Fisheries and Aquatic Sciences
Fisheries and Oceans Canada
867 Lakeshore Rd., P.O. Box 5050
Burlington ON L7R 4A6 CANADA

© Her Majesty the Queen in Right of Canada, 2006.
Cat. No. 97-4/2772E ISSN 0706-6473

Correct citation for this publication:

Edwards, A. and N.E. Mandrak. 2006. Fish assemblage surveys of the Lower Thames River, Ontario, using multiple gear types: 2003-2004. Can. Manuscr. Rpt. Fish. Aquat. Sci. 2772: vii + 94 pp.

TABLE OF CONTENTS

TABLE OF CONTENTS III
ABSTRACT VI
RÉSUMÉ VII
1.0 INTRODUCTION 1
2.0 METHODS 2
  2.1 SITE SELECTION 2
  2.2 SAMPLING METHODS – 2003 2
    2.2.1 Wadeable Sites 2
    2.2.2 Non-Wadeable Sites 3
  2.3 SAMPLING METHODS – 2004 3
    2.3.1 Wadeable Sites 3
    2.3.2 Non-Wadeable Sites 4
  2.5 HABITAT DATA COLLECTION 4
3.0 RESULTS 4
  3.1 2003 SAMPLING 4
    3.1.1 Wadeable Sites 4
    3.1.2 Non-Wadeable Sites 5
  3.2 2004 SAMPLING 7
    3.2.1 Wadeable Sites 7
    3.2.2 Non-Wadeable Sites 9
  3.3 SPECIES AT RISK 10
  3.4 HABITAT DATA 11
4.0 DISCUSSION 12
  4.1 2003 FISH ASSEMBLAGES 12
    4.1.1 Wadeable Sites 12
    4.1.2 Non-Wadeable Sites 13
  4.2 2004 FISH ASSEMBLAGES 14
    4.2.1 Wadeable Sites 14
    4.2.2 Non-Wadeable Sites 16
  4.3 SPECIES AT RISK IN THE THAMES RIVER 17
    4.3.1 SAR and Associated Habitat Characteristics 17
    4.3.2 SAR and Sampling Gear 21
5.0 RECOMMENDATIONS 23
6.0 ACKNOWLEDGEMENTS 23
7.0 LITERATURE CITED 24

LIST OF TABLES

Table 1. Summary of catch data for bag seine and straight seine sites on the lower Thames River, 2003....26
Table 2. Summary of catch data for passive gear types used at non-wadeable sites on the lower Thames River, 2003....26
Table 3. Summary of catch data for active gear types used at non-wadeable sites on the lower Thames River, 2003....26
Table 4. Summary of catch data for seine net sites (wadeable sites) on the lower Thames River July – September, 2004....27
Table 5. Summary of catch data from seine net and backpack electrofishing sites (wadeable sites) in tributaries of the lower Thames River, 2004....27
Table 6. Summary of catch data from boat electrofishing sites (non-wadeable) in the lower Thames River, July and August 2004....27
Table 7. Species at risk detected in the lower Thames River, 2003 and 2004....28
Table 8. Sites where species at risk were detected in the lower Thames River, 2003....29
Table 9. Sites where species at risk were detected in the lower Thames River, 2004....30
Table 10. Species detected at bag seine and straight seine sites on the lower Thames River, 2003....31
Table 11. Species detected at non-wadeable sites in the lower Thames River with active and passive gear types, 2003....32
Table 12. Species detected at nine sites sampled with both passive and active gear types, lower Thames River, 2003....33
Table 13. Catch data from lower Thames River sites sampled with both active and passive gear types....34
Table 14. Species detected at seine net sites in the lower Thames River, 2004....35
Table 15. Species detected at backpack electrofishing and seine net sites in tributaries of the lower Thames River, 2004....36
Table 16. Species detected at boat electrofishing sites in the lower Thames River, 2004....37

LIST OF FIGURES

Figures 1 – 3. Sites sampled on the lower Thames River in 2003....38
Figures 4 – 6. Sites sampled on the lower Thames River in 2004....41
Figures 7 – 10. Sites sampled in tributaries of the lower Thames River in 2004....44

LIST OF APPENDICES

Appendix 1. Common and scientific names of species detected in the lower Thames River and its tributaries in 2003 and 2004....48
Appendix 2. Site descriptions for 2003 sites on the lower Thames River....50
Appendix 3. Site descriptions for 2004 sites on the lower Thames River....52
Appendix 4. Site descriptions for lower Thames River tributary sites in 2004....54
Appendix 5. Summary of effort and gear type used for 2003 lower Thames River sites....55
Appendix 6. Effort expended and species captured at bag seine sites in the lower Thames River, 2003....57
Appendix 7. Effort expended and species captured at straight seine sites in the lower Thames River, 2003....58
Appendix 8. Effort expended and species captured at gill net sites on the lower Thames River, 2003....59
Appendix 9. Effort expended and species captured at large-mesh fyke net sites on the lower Thames River, 2003....59
Appendix 10. Effort expended and species captured at large-mesh fyke net/minnow trap/ Windemere trap sites on the lower Thames River, 2003....59
Appendix 11. Effort expended and species captured at large-mesh fyke net/minnow trap sites on the lower Thames River, 2003....60
Appendix 12. Effort expended and species caught at small-mesh fyke net sites on the lower Thames River, 2003....61
Appendix 13. Effort expended and species captured at boat electrofishing sites on the lower Thames River, 2003....62

Appendix 14. Effort expended and species captured at boat seine sites on the lower Thames River, 2003....63
Appendix 15. Effort expended and species captured at trawl sites on the lower Thames River, 2003....64
Appendix 16. Effort and gear type used at sites on the lower Thames River, 2004....65
Appendix 17. Effort and gear types used at lower Thames River tributary sites, 2004....70
Appendix 18. Effort expended and species captured at seine sites on the lower Thames River, July 2004....71
Appendix 19. Effort expended and species captured at seine sites on the lower Thames River, August 2004....73
Appendix 20. Effort expended and species captured at seine sites on the lower Thames River, September 2004....75
Appendix 21. Sixteen comparable seine net sites, 2004....77
Appendix 22. Effort expended and species captured at backpack electrofishing sites in lower Thames River tributaries, 2004....80
Appendix 23. Effort expended and species captured at seine net sites in lower Thames River tributaries, 2004....82
Appendix 24. Effort expended and species captured at boat electrofishing sites on the lower Thames River, July 2004....83
Appendix 25. Effort expended and species captured at boat electrofishing sites on the lower Thames River, August 2004....84
Appendix 26. Effort expended and species captured at nine comparable boat electrofishing sites on the lower Thames River, 2004....86
Appendix 27. Habitat data at 2003 lower Thames River sites....88
Appendix 28. Habitat data at 2004 lower Thames River sites....90
Appendix 29. Habitat data at lower Thames River tributary sites, 2004....94

ABSTRACT

In 2003, Fisheries and Oceans Canada (DFO) and the Ontario Ministry of Natural Resources (OMNR) conducted a fish community survey of the lower Thames River using a variety of active and passive gear types. DFO returned in 2004 to continue with the survey and to conduct targeted sampling for the eastern sand darter (*Ammocrypta pellucida*). Sampling in 2004 was conducted using boat electrofishing and seine netting. Various lower Thames River tributaries were also sampled in 2004 using backpack electrofishing and seine nets. The objectives of the 2003 and 2004 surveys were: 1) to assess the current fish community in the lower Thames River and to evaluate the distribution of fish species at risk (SAR); 2) to document the distribution and quantity of habitat associated with fish SAR within the lower Thames River; and, 3) to determine the best sampling gear and effort to sample fish SAR.

In 2003, a total of 2635 fishes representing 30 species were collected from nine wadeable sites using active gear types. Nineteen non-wadeable sites were sampled with passive gear types and yielded a total catch of 468 fishes, representing 26 species. Thirty-one non-wadeable sites were sampled with active gear types and yielded a total catch of more than 7904 fishes and a species richness of 46. Seven SAR were detected in 2003.

Sampling was conducted in 2004 over a three month period (July to September) using seine nets and a boat electrofishing unit. More than 11 628 fishes representing 49 species were collected from 41 seine sites during this time. Twenty-six boat electrofishing sites yielded a total catch of 1138 fishes and 36 species. Twenty-two boat electrofishing sites and eight seine net sites in tributaries of the lower Thames River yielded a total catch of 3053 fishes representing 50 species. Three fish SAR were collected in 2004.

RÉSUMÉ

En 2003, Pêches et Océans Canada (MPO) et le ministère des Richesses naturelles de l'Ontario (MRNO) ont mené une étude sur la communauté de poissons de la rivière Thames inférieure en utilisant divers types de matériel actif et passif. Le MPO est retourné en 2004 afin de poursuivre l'étude et de réaliser l'échantillonnage ciblé pour le dard de sable (*Ammocrypta pellucida*). L'échantillonnage de 2004 a été réalisé à l'aide de la pêche électrique en bateau et de senne. Divers affluents de la rivière Thames inférieure ont également été échantillonnés en 2004 à l'aide de la pêche électrique au moyen de sac à dos et de sennes. Les études de 2003 et 2004 visaient à : 1) déterminer la communauté de poissons actuelle de la rivière Thames inférieure et évaluer la répartition des espèces de poissons en péril (LEP); 2) documenter la répartition et la quantité de l'habitat associé aux espèces de poissons en péril à l'intérieur de la rivière Thames inférieure; et 3) déterminer le meilleur matériel d'échantillonnage et les meilleures initiatives pour échantillonner les espèces de poissons en péril.

En 2003, un total de 2 635 poissons représentant 30 espèces ont été recueillis à partir des neuf sites dans lesquels on peut marcher en utilisant des types de matériel actif. Dix-neuf sites dans lesquels on ne peut pas marcher ont été échantillonnés avec des types de matériel passif et permirent une capture totale de 468 poissons, représentant 26 espèces. Trente et un sites dans lesquels on ne peut pas marcher ont été échantillonnés à l'aide de divers types de matériel actif et ont permis de capturer un total de plus de 7 904 poissons et une abondance de 46 espèces. Sept espèces de poissons en péril été ont décelées en 2003.

L'échantillonnage a été réalisé en 2004 au cours d'une période de trois mois (de juillet à septembre) en utilisant des sennes et une unité de pêche électrique en bateau. Plus de 11 628 poissons représentant 49 espèces ont été recueillis à partir des 41 sites de senne au cours de cette période. Vingt-six sites de pêche électrique en bateau ont permis de capturer un total de 1 138 poissons et 36 espèces. Vingt-deux sites de pêche électrique en bateau et huit sites de senne dans les affluents de la rivière Thames inférieure ont permis de capturer un total de 3 053 poissons représentant 50 espèces. Trois espèces de poissons en péril ont été recueillies en 2004.

1.0 INTRODUCTION

The Thames River originates northeast of London, Ontario and flows for 273 km through southwestern Ontario to Lake St. Clair (CHRS 2006). The Thames drains 5285 km^2 of land, making it the second largest watershed in southwestern Ontario (CHRS 2006). The upper portion of the Thames River (known as the upper Thames River) consists of three distinct branches: 1) the North Thames River; 2) the Middle Thames River; and, 3) the South Thames River. The Middle and South Thames join east of London, Ontario, while the North and South Thames join at the historic Fork in London. From this point onward, the river, known as the lower Thames River, flows southwest passing through Chatham and several more communities, including four First Nation Reserves, before it drains into Lake St. Clair at Lighthouse Cove (CHRS 2006).

The Thames River and its tributaries are home to the most diverse fish fauna in Canada (Staton and Mandrak 2006). Ninety species of fish are found in the river, representing approximately 75% of Ontario's established fish species. More than one quarter of freshwater fish species that are federally listed as being at risk have been found in the Thames River (UTRCA 2006); currently, there are 12 fish species at risk (SAR) that have been known to occur in the Thames River watershed. The main factors threatening SAR in the Thames River include siltation and turbidity, nutrient loading, toxic compounds, altered water flow, barriers to movement, non-native species, disturbance (from development or recreational activities) and thermal pollution (Taylor *et al.* 2004).

During the summer of 2003, Fisheries and Oceans Canada (DFO), in partnership with the Ontario Ministry of Natural Resources (OMNR), conducted a fish community survey of the lower Thames River using a variety of gear types (10 gear type combinations), including both active and passive sampling methods. In 2004, DFO returned, in part, to continue with a basic survey of the fish assemblages, and to conduct targeted sampling for eastern sand darter (*Ammocrypta pellucida*) (common and scientific names according to Nelson *et al.* 2004; listed in Appendix 1) as part of a separate tagging project. Sampling in 2004 was conducted using a combination of boat electrofishing and seine netting. As well as sampling the main stem of the lower Thames River, DFO also sampled various tributaries in 2004, using both backpack electrofishing units and seine nets.

The objectives of the fish community surveys in 2003 and 2004 were: 1) to assess the current fish community in the lower Thames River and to evaluate the distribution of fish SAR; 2) to document the distribution and quantity of habitat associated with fish SAR within the lower Thames River; and, 3) to determine the best sampling gear and effort to sample fish SAR.

2.0 METHODS

2.1 SITE SELECTION

Sites on the lower Thames River in 2003 (Figures 1, 2, 3) and 2004 (Figures 4, 5, 6) were selected based on the presence of four boat access points located between London and Chatham. Sites were selected upstream and downstream of each access point. Both wadeable and non-wadeable habitats were sampled using active and/or passive sampling methods. Wadeable sites are defined as sites with water levels below the sampler's waist and containing a reasonably stable substrate. Wadeable sites were sampled with backpack electrofishing units and/or straight or bag seine nets. Non-wadeable sites were sampled with one or more of the following gear types: boat electrofishing, boat seine, fyke nets, gill nets and trawl nets. Special consideration was given to historical sampling locations to ensure that they were revisited and fish community records could be updated accordingly. Historical locations of fish SAR were revisited to review the status of these species. In addition, selected lower Thames River tributaries were also sampled in 2004. These included Baptiste Creek, Cornwall Creek, Duck Creek, Jeanette's Creek, Julian Drain, McDougal Creek, MacGregor Drain and White Ash Creek (Figures 7, 8, 9, 10). Site descriptions for 2003 and 2004 sampling on the lower Thames and its tributaries are in Appendices 2, 3 and 4.

2.2 SAMPLING METHODS – 2003

Upon completion of sampling at 2003 sites, all species were identified, counted and released. Minimum and maximum lengths were recorded for all species captured. Voucher specimens were kept for lab verification at a later date, and were also sent to the Royal Ontario Museum (ROM) for further verification as well as cataloguing or disposal.

2.2.1 Wadeable Sites

Seine Net – Nine wadeable sites were sampled with an 8.5 m bag seine with 6.35 mm mesh (three sites), or a 10 m straight seine with 6.35 mm mesh (six sites).

Effort was recorded as number of hauls per site, which was dependent on accessibility and the presence of obstacles in the water. If no obstructions were present, sampling usually continued until no new species were detected or five hauls had been performed.

2.2.2 Non-Wadeable Sites

Passive Gear Types

Gill Net – Two gill net sites were sampled with a 30 m gill net (38 mm mesh). Effort was recorded as hours of set time.

Large-Mesh Fyke Net/Minnow Trap/Windermere Trap – A 1.2 m large-mesh (25 mm) fyke net was used alone (one site) and in conjunction with minnow traps (six sites) and/or Windermere traps (three sites). One minnow trap and/or one Windermere trap was placed on either side of the lead, between the wings and the lead. Nets were set and left overnight. Effort was recorded as hours of set time.

Small-Mesh Fyke Net – A 1.2 m small-mesh (6.35 mm) fyke net was used to sample seven non-wadeable sites. Nets were set and left overnight, and effort was recorded as hours of set time.

2.3 SAMPLING METHODS – 2004

Upon completion of sampling at 2004 sites, all species were identified, counted and released. Minimum and maximum lengths were recorded for all species captured. Voucher specimens were kept for lab verification at a later date, and were also sent to the Royal Ontario Museum (ROM) for further verification as well as cataloguing or disposal.

2.3.1 Wadeable Sites

Thames River Tributaries

Backpack Electrofishing – Electrofishing was performed using a Smith Root LR-24 backpack electrofishing unit. Stunned fishes were netted as they approached the surface and transferred into buckets. Sampling effort was recorded in seconds for each site.

Thames River Proper and Thames River Tributaries

Seine Net – Sampling was conducted using three types of seine nets: an 8.5 m bag seine with 6.35 mm mesh, a 10 m straight seine with 6.35 mm mesh; and, a 5 m seine with 6.35 mm mesh (used only in the Thames River tributaries). Effort was recorded as number of hauls per site, which was dependent on accessibility and the presence of obstacles in the water. If no obstructions were present, sampling usually continued until no new species were detected or five hauls had been performed.

2.3.2 Non-Wadeable Sites

Thames River Proper

Boat Electrofishing – Electrofishing was performed using a 4.27 m, single boom electrofishing boat. The bc was equipped with a 5.0 kW Smith-Root generator, 5.0 GPP control box and dual foot pedals. One netter retrieved stunned fishes as they appeared and all fishes were transferred from the river into buckets with water within the boat. Sampling effort was recorded in seconds for each site.

2.5 HABITAT DATA COLLECTION

Habitat data at each of the 2003 and 2004 sites were described by recording air and water temperature, conductivity, maximum water depth, distance from shore, maximum sampling depth, substrate type, aquatic vegetation and Secchi depth. Habitat data were recorded upon completion of sampling.

3.0 RESULTS

3.1 2003 SAMPLING

A summary of effort and gear type used in 2003 is in Appendix 5.

3.1.1 Wadeable Sites

Bag Seine – Three sites (38, 46, 48), sampled on the 23rd and 24th of September with an 8.5 m bag seine, yielded a total catch of 459 fishes representing 17 species. Thirty-four percent of the catch was comprised of emerald shiner (*Notropis atherinoides*). The next most abundant species were bluntnose minnow (*Pimephales notatus*), gizzard shad (*Dorosoma cepedianum*) and ghost shiner (*Notropis buchanani*). Site 46 had the highest total catch (212 fishes), while sites 48 and 38 had total catches of 103 and 144, respectively (Table 1, Appendix 6).

Each site was seined five times and the average catch-per-unit-effort (CPUE) was 30.6 fish/haul (Appendix 6).

Straight Seine – On September 23rd and 24th, six sites (37, 39, 47, 49-51) were sampled with a 10 m straight seine yielding 30 species and a total catch of 2176 fishes. Three species made up 68% of the catch: emerald shiner, ghost shiner and bluntnose minnow. Site 50 had the highest number of fishes caught (1179) and Site 39 had the lowest (38) (Table 1, Appendix 7).

Each site was seined five times and the average CPUE was 12.53 fish/haul (Appendix 7).

3.1.2 Non-Wadeable Sites

Passive Gear Types

Nineteen non-wadeable sites were sampled using various passive gear type combinations. A total of 468 fishes representing 26 species were collected at these sites. One common carp (*Cyprinus carpio*) x goldfish (*Carassius auratus*) hybrid was also detected with a gill net at Site 6.

Gill Nets – Two sites (5 and 6) sampled with gill nets on July 16th, detected ten species and caught 78 fishes. Site 5 had a total catch of 23 and Site 6 had a catch of 55. Channel catfish (*Ictalurus punctatus*) was the most abundant species caught at these two sites, followed by white perch (*Morone americana*) and white bass (*Morone chrysops*) (Table 2, Appendix 8).

Gill net sets were 1.35 hours at Site 5 and four hours at Site 6. Site 5 had a CPUE of 17.04 fish/hr and Site 6 had a CPUE of 13.75 fish/hr (Appendix 8).

Large-Mesh Fyke Net – Four fishes, one brown bullhead (*Ameiurus nebulosus*) and three freshwater drum (*Aplodinotus grunniens*), were caught at Site 28a sampled with a large-mesh fyke net. The net was set for 20 hours and the CPUE was 0.2 fish/hr (Table 2, Appendix 9).

Large-Mesh Fyke Net + Minnow Trap + Windemere Trap – A combination of these three gear types was used at three sites (10, 11 and 12). The combined catch from the three sites was 17 fishes with a richness of eight species. Site 10 had the lowest number of fishes (1), and Site 12 had the highest (12), most of which were spottail shiner (*Notropis hudsonius*) (Table 2, Appendix 10). A single buffalo specimen (genus *Ictiobus*) was detected with the large-mesh fyke net.

Sets were for 21 hours at sites 10 and 11; Site 12 had a set of 25.25 hours. Catch-per-unit-effort values were 0.048 fish/hr, 0.19 fish/hr and 0.48 fish/hr, for sites 10, 11 and 12, respectively (Appendix 10).

Large-Mesh Fyke Net + Minnow Trap – Thirteen species were detected from six sites sampled using the fyke net/minnow trap combination. Two brindled madtom (*Noturus miurus*) detected at Site 24a were caught in the minnow trap. A total of 22 fishes were caught and no species dominated the catch. The total catch was spread somewhat evenly across all six sites with the smallest catch at Site 24a (2) and the largest (6) at Site 13 (Table 2, Appendix 11).

The combination of large-mesh fyke net and minnow trap had sets ranging from 19.75 hours (Site 32a) to 23.5 hours (Site 13). The average set time for the six sites was 21.82 hours. Site 24a had the lowest CPUE (0.09 fish/hr) and Site 13 had the highest (0.25 fish/hr). The average CPUE was 0.16 fish/hr (Appendix 11)

Small-Mesh Fyke Net – More than 347 fishes were collected from seven sites sampled with a small-mesh fyke net. The exact catch is unknown as the number of fishes caught at Site 9 was only an estimate due to the large number of gizzard shad that were not counted. Twenty-one species were detected and the most abundant was gizzard shad, with more than 270 specimens captured, most of them from Site 9. Site 23a had the lowest catch (6) and Site 9 had the highest (over 204) (Table 2, Appendix 12).

Effort at the six sites ranged from 18.5 hours (Site 9) to 23.5 hours (Site 14). The average set time was 20.75 hours. An average CPUE for all six sites could not be determined as the exact number of fishes collected at Site 9 is not known. The average CPUE of the remaining five sites was 1.1 fish/hr (Appendix 12).

Active Gear Types

Thirty-two non-wadeable sites were sampled using three different gear types: boat electrofishing, boat seine and trawl net. More than 7900 fishes were captured at these sites and 46 species were detected.

Boat Electrofishing – The majority of non-wadeable sites (19) were sampled using the boat electrofishing unit. Thirty-nine species were detected and over 3697 fishes were collected from these sites. The actual number of fishes caught is not known as the catch at nine sites was only estimated due to the large number of gizzard shad that were not counted. Gizzard shad was the most abundant species present overall, with more than 2400 individuals captured. Other abundant species included emerald shiner, bluntnose minnow and ghost shiner, which had a combined total of 715. Site 3 had the lowest catch (32) and Site 23b had the highest (more than 505) (Table 3, Appendix 13).

Electrofishing effort ranged from 258 seconds (0.72 hours) (Site 23b) to 960 seconds (0.27 hours) (Site 45), for those sites that had effort recorded (all but Site 41). The average time spent electrofishing (for the 18 sites with effort recorded) was 461.55 seconds (0.13 hours). The average CPUE value for all 19 sites cannot be determined as the actual number of fishes captured was not recorded at nine of the sites. For those sites with data recorded, CPUE values ranged from 210 fish/hr (Site 36) to 1493.09 fish/hr (Site 44) (Appendix 13).

Boat Seine – Ten sites were sampled with a boat seine yielding a total catch of more than 3076 and a species richness of 30. Gizzard shad was the most abundant species with more than 1776 individuals caught. Other abundant species included ghost shiner (259), emerald shiner (232), channel catfish (159) and yellow perch (*Perca flavescens*) (more than 151). Site 16 had the lowest catch (63) and Site 1 had the highest (more than 1313 fishes) (Table 3, Appendix 14).

Effort was the same at all sites, which were seined once. Four sites only had catch estimates due to the high number of gizzard shad captured; therefore, it was not possible to determine CPUE values for these sites. However, of the sites that had catch values recorded, Site 16 had the lowest CPUE (63 fish/haul) and Site 33 had the highest (254 fish/haul). The average CPUE for sites with complete catch data was 156.5 fish/haul (Appendix 14).

Trawl – Fifteen species were detected from two sites sampled with a trawl; an attempt was made to sample a third site (15) but the trawl snagged and no data were recorded. The combined catch at both sites was 1131 fishes. Site 8 had a total catch of 147 fishes and 984 fishes were collected at Site 4. Three species combined to make up 57% of the catch: freshwater drum (20%), gizzard shad (20%) and brown bullhead (18%) (Table 3, Appendix 15).

Effort was recorded as number of hauls conducted; no effort was recorded for Site 8, and Site 4 had an effort of 5 hauls. The CPUE for Site 4 was 196.8 fish/haul (Appendix 15).

3.2 2004 SAMPLING

A summary of effort and gear types for 2004 lower Thames River proper and tributary sites are in Appendix 16 and 17.

3.2.1 Wadeable Sites

Thames River

Fisheries and Oceans Canada sampled the lower Thames River extensively in the summer of 2004. Sampling took place over a span of three months with three distinct sampling events occurring over this time. Sites were sampled using seine nets and boat electrofishing during the first two sampling periods (July and August) and seine nets only during the last sampling period (September). Thirty-two sites were sampled in July, 41 in August and 32 in September. In July, of the 32 sites sampled, 16 sites were sampled using both seine nets and boat electrofishing. In August, of the 41 sites sampled, 26 were also sampled with both gear types. Sampling in September was conducted using only seine nets.

The actual total catch values for July and August are unavailable as, for unknown reasons, species presence was recorded but the number of individuals of each species captured was not recorded for every site. Seine net (bag and straight seine) sites yielded a total catch of >2141, >2859 and 6628 fishes during July, August and September, respectively (Table 4). Thirty-six species were detected during July, four of which comprised the majority of the catch: spotfin shiner (*Cyprinella spiloptera*) (>711), bluntnose minnow (>367), emerald shiner (>260) and mimic shiner (*Notropis volucellus*) (>154) (Table 4, Appendix 18). Species richness during August was 39, and six species comprised much of the total catch: spotfin shiner (>832), bluntnose minnow (>480), emerald shiner (>425), eastern sand darter (234), mimic shiner (>138) and johnny darter (*Etheostoma nigrum*) (>135) (Table 4, Appendix 19). Two species, bluntnose minnow (46%) and spotfin shiner (33%), dominated the catch in September; a total of 38 species were detected (Table 4, Appendix 20).

Five seine hauls were performed at the majority of sites during each sampling period, except for two sites that had three seine hauls and four sites that had no effort recorded. Unfortunately, average CPUE values cannot be determined for either the first or second sampling periods in July and August, because, as mentioned previously, the number of fishes caught and/or the effort expended at a number of sites was not recorded. However, for comparison purposes, average CPUE values for the three sampling periods were determined using those sites with complete information across all three sampling periods (a total of 16 sites). The average CPUE for July, August and September was 21.12 fish/haul, 15.32 fish/haul and 48.31 fish/haul, respectively (Appendix 21).

Thames River Tributaries

Backpack Electrofishing – Twenty-two sites sampled using a backpack electrofishing unit yielded a total catch of 1931 and a species richness of 42 (Table 5). Of these, the most abundant were bluntnose minnow (17%), central mudminnow (*Umbra* *limi*) (12%) and creek chub (*Semotilus atromaculatus*) (9%). Two darter species, least darter (*Etheostoma microperca*) and johnny darter were also relatively abundant at these sites (combined, totalling 12% of the total catch) (Appendix 22).

Electrofishing effort per site varied from 292 seconds (0.081 hours) to 4924 seconds (1.38 hours) of shocking time. The average time spent electrofishing was 1047.64 seconds (0.29 hours) and the overall average CPUE was 414.3 fish/hr (Appendix 22).

Seine Netting (straight seine, bag seine and mini seine) – Eight seine sites had a total catch of 1122 fishes and a species richness of 35 (Table 5). White crappie (*Pomoxis annularis*), common shiner (*Luxilus cornutus*), bluntnose minnow and ghost shiner comprised 70% of the total catch (Appendix 23). Six of the eight seine sites were sampled with an 8.5 m bag seine, while Site 8a and Site 13 were sampled with a 5 m mini-seine and a 10 m straight seine, respectively. Site 8a had the lowest catch (15) and Site 24a had the highest (385).

The number of hauls per site at the eight seine sites ranged from one at Site 8a to five at Site 24a. The average number of hauls per site was 2.6. The average CPUE for the eight sites combined was 54.07 fish/haul (Appendix 23).

3.2.2 Non-Wadeable Sites

Thames River

Sampling in July and August at non-wadeable sites (sampled with boat electrofishing unit) yielded a total of 455 and 683 fishes representing 29 and 32 species, respectively (Table 6). Emerald shiner and bluntnose minnow were two predominant species in July, representing more than half (51%) the total catch (Appendix 24). Site 7b had the lowest catch in July, with 5 fishes caught and Site 1b had the highest, with 81 fishes caught. In August, the three most abundant species were gizzard shad (17%), shorthead redhorse (*Moxostoma macrolepidotum*) (14%) and northern hog sucker (*Hypentelium nigricans*) (11%). Site 34b had the smallest catch (4), and Site 9b had the highest (82) (Appendix 25).

Electrofishing effort was not recorded for every site in either July or August; therefore, to facilitate comparisons between the two sampling periods, only those sites sampled during both periods and with complete data were used to determine effort and CPUE (a total of nine sites). The average time spent electrofishing in July was 667 seconds (0.18 hours) and the average CPUE was 182.51 fish/hr. The average time spent electrofishing in August was 609.33 seconds (0.17 hours) and the average CPUE was 206.47 fish/hr (Appendix 26). Individual site CPUEs for all sites in July and August with complete data are in Appendices 24 and 25.

3.3 SPECIES AT RISK

2003

Six SAR were detected during the Thames River survey in 2003 (Table 7), they are (their status as designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in parentheses): northern madtom (*Noturus stigmosus*) (Endangered); black redhorse (*Moxostoma duquesnei*) (Threatened); eastern sand darter (Threatened); greenside darter (*Etheostoma blennioides*) (Special Concern); river redhorse (*Moxostoma carinatum*) (Special Concern); and, spotted sucker (*Minytrema melanops*) (Special Concern).

Three individuals of an unknown buffalo species (genus *Ictiobus*) were also detected during 2003 sampling. All of the specimens had subterminal mouths; therefore, they were not bigmouth buffalo (*Ictiobus cyprinellus*), which has a terminal mouth and is listed as Special Concern by COSEWIC. It is unknown whether these individuals were black buffalo (*Ictiobus niger*) (Special Concern) or smallmouth buffalo (*Ictiobus bubalus*), as distinguishing between these two species using physical characteristics alone is difficult (H. Bart, Tulane University, pers. comm.).

One northern madtom was detected at Site 42 with the boat electrofishing unit; this species was not detected at any other sites. Five black redhorse were collected from three boat electrofishing sites (Site 34, 1 specimen; Site 35, 2 specimens; Site 42, 2 specimens) (Table 8). Eastern sand darter was detected at two straight seine sites (39 and 50) and four boat electrofishing sites (42-45); a total of 12 specimens were collected. Three greenside darter were detected from two straight seine sites (47 and 51) and one boat electrofishing site (45). River redhorse was collected at two sites (Site 41, 1 specimen; Site 43, 1 specimen), both of them boat electrofishing sites. Six spotted sucker were detected at five sites: two from Site 21a (large-mesh fyke net + minnow trap); one from Site 20b (boat electrofishing); one from Site 35 (boat electrofishing); one from Site 19a (small-mesh fyke net); and, one from Site 30a (small-mesh fyke net) (Table 8).

Three buffalo specimens were collected from both gill net sites (sites 5 and 6) and one large-mesh fyke net/minnow trap/Windemere trap site (Site 10) (Table 8).

2004

Three SAR were detected from the lower Thames River and its tributaries in 2004: eastern sand darter, greenside darter and northern madtom (Table 7). Eastern sand darter was detected at 19 sites in July, 25 sites in August and 19 sites in September (Table 9). In July, 96 eastern sand darter were detected at 18 seine net sites and six boat electrofishing sites. Of these sites, specimens were detected from five of them using both gear types (Table 9). Two hundred and thirty-five eastern sand darter were collected at 25 seine sites and one boat electrofishing site in August and, of these sites, individuals were detected at one site using both gear types (Table 9). Specimens in September (188 individuals) were all captured using seine nets as this was the only gear type used during this sampling period.

Greenside darter was detected from 11 sites in July, 17 sites in August and 16 sites in September. Thirty-nine individuals were caught from seven seine net sites and four boat electrofishing sites in July; of these sites, individuals were caught at two sites with both gear types. In August, 90 specimens were caught from 15 seine sites and two boat electrofishing sites; of these 17 sites, greenside darter were detected at one site using both gear types. Seventy-two individuals were detected from seine sites in September (Table 9). One northern madtom was captured at Site 11a (seine net site) in August (Table 9).

Only one SAR, the greenside darter, was detected in the lower Thames tributaries sampled in 2004. Nine specimens were collected from Sites 2 and 11, both backpack electrofishing sites (Appendix 22).

3.4 HABITAT DATA

2003

Habitat characteristics at the 2003 Thames River sites are found in Appendix 27. Secchi depth data, air temperature and water temperature were not recorded for the majority of sites. For those sites that had complete Secchi depth data, depths ranged from 0.2 m – 0.45 m. Vegetation was absent from all sites aside from one (Site 49), which had grass over approximately 10% of the site. The majority of sites had a slow flow rate; Sites 40-43 had a medium flow rate, Site 44 had a medium to fast flow rate and Site 45 had a fast flow rate. Substrate information was only recorded for seven sites, the majority of which (six sites) had substrates predominantly of sand and gravel. Site 39 had a mixture of sand (50%), clay (25%) and silt (25%).

2004

Habitat characteristics for the 2004 Thames River and Thames River tributary sites are in Appendices 28 and 29, respectively.

Thames River Proper

For those sites that had Secchi values recorded, depths ranged from 0.22 m – 1.2 m (July), 0.2 m – 1.8 m (August) and 0.15 m - > 1.5 m (September). The majority of sites during all three months had no aquatic vegetation present. Three sites had some form of vegetation during the first and second sampling periods (Sites 18a, 28 and 29); seven sites had vegetation present during the third sampling period (Sites 18a, 19, 21, 23, 24, 26, 28). The average water temperature during the first, second and third sampling periods was 22.72°C, 23.03°C and 17.62°C, respectively. Substrate at most sites was a combination of gravel, sand, clay and silt. Sand was the dominant substrate at 23 sites, gravel was dominant at 10 sites and clay was dominant at four sites.

Thames River Tributaries

Secchi depths at 28 tributary sites ranged from 0.1 m to > 1.25 m (for those sites with this information recorded). Aquatic vegetation was present at 19 sites; one site (17) had no information recorded regarding vegetation. Substrates were a combination of silt, sand, organic matter and clay. Water temperatures ranged from 14.0°C to 26.3°C, with an average water temperature of 19.8°C. Most sites had slow or no discernible flow rates; 10 sites had no information recorded regarding flow rates.

4.0 DISCUSSION

4.1 2003 FISH ASSEMBLAGES

4.1.1 Wadeable Sites

A total of nine wadeable sites were sampled in 2003. More than four times as many fishes were captured at six straight seine sites compared to three bag seine sites; the average CPUE at the bag seine sites was 30.6 fish/haul while the average CPUE at the straight seine sites was 72.53 fish/haul (Appendices 6 and 7). Species composition was somewhat similar for both bag and straight seine; bluntnose minnow, emerald shiner, ghost shiner, gizzard shad and spotfin shiner were the most abundant species for both (Appendices 6 and 7). Straight seine sites detected a total of 13 more species than bag seine sites, including two SAR (eastern sand darter and greenside darter) (Table 10). However, this was likely a result of the extra sites sampled with the straight seine, as, on average, the number of species captured per haul was very similar for both gear types (bag seine – 2.6 species /haul; straight seine 2.8 species/haul). Habitat characteristics were similar at all nine sites, which were characterized as having slow flows (Site 47 had a slow/medium flow), no aquatic vegetation and depths of 1.5 to 3.5 m. Substrate type was not recorded for all nine sites; however, it was described as a mixture of sand, gravel and clay at sites that had substrate information recorded (Appendix 27).

4.1.2 Non-Wadeable Sites

Fifty-one non-wadeable sites were sampled with active (32 sites) and passive (19 sites) gear types in mid- to late-summer in 2003. Active gear types included boat electrofishing, boat seining and trawling, while passive gear types included gill nets, small-mesh fyke nets and combinations of large-mesh fyke nets, minnow traps and Windermere traps. Examined individually, of the active gear types, the trawl had the lowest species diversity (15) while boat electrofishing had the highest (39); the boat seine detected 30 species. Of the passive gear types, the large-mesh fyke net used alone had the fewest species (2) while the small-mesh fyke net had the highest (21) (Table 11). The trawl and boat electrofishing were the only gear types, of both passive and active, that caught species unique to those sites: one species (walleye (*Sander vitreus*)) was only caught with the trawl, while 10 species were only detected with the boat electrofishing unit, including five SAR.

Overall, active gear types caught more fishes and detected more species than passive gear types: more than 6141 fishes and 46 species for active gear types compared to 390 fishes and 26 species for passive gear types (Tables 2, 3 and 11). Although effort was not equal between the two types (13 more sites were sampled using active gear types compared to passive), these results suggest that active gear types may be more effective at capturing more individuals of species, but not necessarily more effective at detecting species. For example, 1131 fishes representing 15 species were caught at two trawl sites, while three combination large-mesh fyke net/minnow trap/Windermere trap sites captured just 17 fishes but detected eight species (Tables 2, 3 and 11). Further support appears to come from examining nine of the 51 sites sampled with both active and passive gear types. At these nine sites, active gear types (boat electrofishing) captured more than 38 times the number of fishes as passive gear types (small-mesh fyke net, large-mesh fyke net alone and in combination with minnow trap), but detected the same number of species (17) (Tables 12 and 13). However, one species, gizzard shad, dominated the boat electrofishing catch (more than 2400 gizzard shad caught out of a total catch of more than 2491 fishes). If gizzard shad are removed from boat electrofishing total catch values, 91 fishes were caught by electrofishing compared to 64 for the combined passive gear types. A similar situation is observed for the other active gear types used (i.e. boat seining and trawling): more than 1776 of the fishes caught with the boat seine and 224 of the fishes caught with the trawl were gizzard shad (Appendices 14 and 15). These high numbers were also observed at sites sampled with the small-mesh fyke net, where more than 271 out of at least 347 fishes were gizzard shad (Appendix 12). The schooling nature of the species likely increases the probability that gizzard shad, if they are detected, will be detected in high numbers.

Although from these results, it seems that active and passive gear types are equally effective at species detection, they did not detect all the same species. Boat electrofishing and the fyke net combinations (at the nine sites sampled with both active and passive gear types) only had about half the species detected in common and each caught eight species unique to that gear type. This suggests that, although active and passive gear types may be equally efficient at detecting species, they are probably selective for different species. Another possible explanation for these results could be the different months in which each gear type was used (passive gear type sampling occurred in July, while active gear type sampling occurred in September); this may have influenced the species detected by each gear type.

A true comparison of CPUE cannot be made for the nine sites sampled both with boat electrofishing and fyke netting because, to make this comparison, it is necessary to compare the amount of time taken to obtain the sample using fyke nets (i.e. setting and fishing the nets (excluding soak time)), to electrofishing. Therefore, CPUE should be measured as fish/person-hour (Pugh and Schramm 1998). However, in this case, effort was recorded as the soak time (i.e. 22 hours) and the time it took to set and fish the nets was not recorded; therefore, it is not possible to make a direct comparison between fyke netting and boat electrofishing.

4.2 2004 FISH ASSEMBLAGES

4.2.1 Wadeable Sites

Thames River Proper

Fisheries and Oceans Canada sampled a total of 41 sites using seine nets, over a three-month span in the summer of 2004. The same 32 sites were sampled during each of July, August and September, and nine additional sites were also surveyed in

August. Species richness was comparable between July, August and September, with 36, 39 and 38 species detected during each sampling period, respectively (Table 14). Of the 39 species detected in August, brindled madtom and round goby (*Neogobius melanostomus*) were detected at Sites 40 and 41, respectively, which were not sampled during July or September. One species, longnose dace (*Rhinichthys cataractae*), was only detected in July, while August and September detected four and five species, respectively, that were unique to those sampling periods. With respect to the total number of fishes caught, effort expended and CPUE, it was only possible to do direct comparisons for 16 of the 32 sites sampled during July, August and September. Effort was the same for all 16 sites over all three periods: 5 hauls/site using a straight seine net. September had the highest total catch with 3865 fishes collected, while July and August had total catches of 1690 and 1226, respectively (Appendix 21). All three sampling periods had similar species richness values with 28, 29 and 30 species detected during July, August and September, respectively (Table 14). Species composition was very similar for all three periods with 30 species common to at least two of the sampling periods and 20 species common to all three. Three species unique to that sampling period (brook stickleback (*Culaea inconstans*), goldfish and spottail shiner) were detected in August, while four species were detected only in September (black crappie (*Pomoxis nigromaculatus*), ghost shiner, golden shiner (*Notemigonus crysoleucas*) and hornyhead chub (*Nocomis biguttatus*)); sampling in July did not detect any unique species. Bluntnose minnow and spotfin shiner were the two most abundant species during all three sampling periods, which may have been a function of their schooling behaviour. Catch-per-unit-effort values were comparable for July (21.12 fish/haul) and August (15.32 fish/haul), while the CPUE for September was more than double that of the first two months (48.31 fish/haul) (Appendix 21). This value was inflated by the high number of bluntnose minnow and spotfin shiner captured during the third sampling period; these two species comprised 88% of the total catch for the 16 sites (Appendix 21).

Thames River Tributaries

In the summer of 2004, DFO sampled 28 sites within various Thames River tributaries using a combination of backpack electrofishing and seine netting. Backpack electrofishing (BPEF) caught more fishes and detected more species than seine netting (combination of straight, bag and mini-seines) (Tables 5 and 15). These numbers are comparable, although 12 more sites were sampled with the BPEF than seine nets; had the number of sites been equal between the two gear types, it is possible that seine netting may have caught more individuals and detected the same number or more species. Backpack electrofishing detected 15 species not found by seine netting, while eight species were unique to seine net sites (Table 15). Out of seven darter species detected in the Thames River tributaries, BPEF detected all seven species, while seine netting detected three (blackside darter (*Percina maculata*), johnny darter and logperch (*Percina caprodes*). Both blackside darter and logperch were only detected at Site 24a, one of the few seine net sites with coarser material such as sand and gravel, the preferred substrate of both species (Eakins 2006), covering the majority of the site. The lack of other darter species, such as the greenside darter and fantail darter (*Etheostoma flabellare*), that prefer substrates of sand, gravel or cobble (Eakins 2006) could have been a result of the small number of seine net sites with these types of substrates present. Neither the Iowa darter (*Etheostoma exile*) or the least darter were detected at seine net sites although suitable habitat was present (i.e. rooted aquatic vegetation, organic and/or sand substrates, slow flow (Iowa darter); sand/mud substrates, slow flow (least darter) (Eakins 2006)) and they are known to occur in the Thames River watershed (Mandrak and Crossman 1992). Backpack electrofishing was more successful at capturing higher numbers of larger species (e.g. black bullhead (*Ameiurus melas*), common carp, quillback (*Carpiodes cyprinus*)) than seine netting. Electrofishing tends to select for larger fishes as a result of total body voltage increasing with the length of the fish (Chow-Fraser *et al.* 2005); larger fishes are also more easily detected by electrofishing netters compared to smaller fishes. Larger individuals may also be able to see and avoid seine nets better than smaller fishes resulting in fewer large individuals being detected with seine nets.

4.2.2 Non-Wadeable Sites

The lower Thames was sampled by boat electrofishing during July and August of 2004. Sixteen sites were sampled in July and re-sampled in August, and an additional ten sites were sampled in August. A total of 29 species were detected from the 16 sites sampled in July while 26 species were captured in August; an additional six species were detected at the ten sites sampled only in August (Table 16). Of the 16 sites sampled each month, there are nine (1b, 2b, 5b-7b, 9b, 12b, 16b, 17b) for which direct comparisons can be made, with respect to total catch, effort and CPUE. The overall CPUE was comparable for the nine sites in July (185.45 fish/hr) and August (198.67 fish/hr) (Appendix 26). Effort at each site varied slightly over the two sample periods, with decreased effort occurring in August at four sites, remaining the same at one site and increasing at four sites, compared to July. Depending on whether there was an increase or decrease in effort, corresponding increases or decreases in the number of fishes caught occurred at every site except for two. There was an increase in CPUE and numbers caught at Site 5b although the effort expended remained the same. An increased CPUE and total catch with decreased effort was found at Site 9b, although the decrease in effort was slight.

Similar total catch values were observed at the nine sites in July (306) and August (300) (Appendix 26). Species composition was also similar during the two months, which had 19 species in common (Table 16). However, the species that made up the majority of the catch in each sampling period were different. Bluntnose minnow and emerald shiner comprised 54% of the catch in July while, in August, these two species comprised only 11% of the total catch. Gizzard shad and shorthead redhorse were the two most abundant species in August, comprising approximately 40% of the total catch; gizzard shad was not detected at all during July sampling and shorthead redhorse represented 6% of the total catch (Appendix 26).

4.3 SPECIES AT RISK IN THE THAMES RIVER

4.3.1 SAR and Associated Habitat Characteristics

2003

In 2003, seven SAR were detected in the Thames River at 17 out of 51 sites. None of the species detected were caught in large numbers; eastern sand darter was the most abundant with 12 specimens captured.

Eastern Sand Darter – Twelve eastern sand darter were detected at six sites, sites 39 and 50, both straight seine sites, and sites 42 to 45, all boat electrofishing sites. The eastern sand darter has relatively specific habitat requirements and is usually found associated with clean sandy substrates in waters with depths of < 0.5 m and velocities < 20 cm/sec, downstream of river bends on the depositional side of the river (Facey 1998). Eastern sand darter locations in 2003 appeared to fit this description for the most part, being relatively shallow (maximum sampling depths 0.4 – 2 m) and, although the current velocity was not measured specifically, flow was described as being medium to fast at four of the sites and slow at two sites (39 and 50). However, substrate type was only recorded for sites 39 and 50; Site 39 was described as being 50% sand, 25% clay and 25% silt, while Site 50 had a mixture of sand (40%), gravel (30%) and clay (30%). It is difficult to say whether Sites 42-45 are areas where one would expect to find eastern sand darter without knowing what the substrate composition is, as this habitat feature is of high importance to the species (Facey 1998).

Greenside Darter – Three greenside darter were detected at three sites, Site 45 (boat electrofishing) and sites 47 and 51, both straight seine sites. The river width at Site 45 was 30 m and the maximum depth sampled was 1 m. This site was described as a riffle/run with a fast current. Substrate information was not recorded for this site. Site 47 was described as slow flowing riffle/run where the river width was 25 m and the maximum depth sampled was 1 m. Substrate composition is unknown for Site 47. Site 51 was a run with a slow to medium flow, a maximum sampling depth of 1 m and a river width of 25 m. Substrate at this site was described as primarily a mixture of sand and gravel, with some clay present. Habitat characteristics at Site 51 are consistent with those reported for greenside darter, which is normally found in creeks and small- to medium-sized rivers over sand, gravel and/or cobble substrates (NatureServe 2006). The lack of substrate information at sites 45 and 47 make it difficult to determine whether these sites are where one would typically find greenside darters.

Buffalo sp. – Three buffalo specimens were detected at three sites (5, 6 and 10). Pictures were taken and DNA samples were obtained from the specimens to determine whether they were black buffalo or smallmouth buffalo. Smallmouth buffalo is not known from Canada; however, there is some confusion as to whether the original buffalo specimens detected in Canadian waters were identified correctly as black buffalo in the first place (Mandrak and Cudmore 2006).

Sites 5 and 6 were gill net sites while Site 10 was a large-mesh fyke net/minnow trap/Windermere trap site. The maximum river depth at the gill net sites was reported as > 2 m, and the maximum depth sampled was also reported as > 2 m for Site 6; the maximum depth sampled was not recorded for Site 5. River width at sites 5 and 6 was 100 m and 35 m, respectively. Flow rate was described as slow for both sites. Aquatic vegetation was absent and no information regarding substrate was recorded, possibly due to the greater depth of the river at these locations. These features suggest that sites 5 and 6 contain suitable black buffalo habitat as this species is normally found in pools and/or backwaters of sloughs and small- to large-sized rivers, and is often found in strong currents of large rivers (NatureServe 2006). In the United States, smallmouth buffalo inhabit the deep warm waters of clean to moderately turbid pools, oxbow lakes and large rivers (NatureServe 2006). The habitat at sites 5 and 6 appear consistent with this description. However, the lack of vegetation is not consistent with ideal smallmouth buffalo habitat; in Texas, habitats with abundant aquatic vegetation and silty bottoms were most productive for this species (NatureServe 2006).

Site 10 was a relatively shallow site, located in a slow-flowing pool, with a maximum sampling depth of 0.6 m. This site was relatively turbid with a Secchi depth of 0.45 m. Substrate type was not recorded and no vegetation was present. Stream width at this site was approximately 100 m. Habitat features at this site were somewhat consistent with the habitat preferences of both buffalo species.

Spotted Sucker – Six spotted sucker were collected from five sites: two small-mesh fyke net sites (19a and 30a), two boat electrofishing sites (20b and 35) and one large-mesh fyke net and minnow trap combination site (21a). This species is typically found in lakes, sloughs, oxbows, overflow ponds and clean sluggish streams, with substrates of sand, gravel and/or hard clay bottoms lacking excessive silt (Scott and Crossman 1998, NatureServe 2006). Habitat characteristics at locations where spotted sucker were captured in 2003 are lacking for most of the sites; the only information for sites 20b, 21a and 30a was that sampling occurred in pools with little current, and the river width at Site 20b was 30 m. Site 35, a boat electrofishing site had the most habitat information recorded. The river at this site was approximately 30 m wide and sampling occurred in a riffle/run at no more than 2 m deep. Substrate at this site was described as a mixture of gravel (50%), sand (30%) and silt (20%). These habitat features appear to be consistent with those preferred by spotted sucker, mentioned above.

River Redhorse – Two river redhorse were collected from two boat electrofishing sites (41 and 43) during the 2003 surveys by DFO. This is the first record for the species in the Thames River. Both sites were similar with respect to width (30-25 m wide), maximum depth sampled (2 m) and flow rate (medium flow). No information was recorded regarding substrate types for either site. River width, depth and flow rate are consistent with reports of river redhorse habitat which prefer swift runs or deep fast-flowing areas of pools, in medium- to large rivers, over substrates of gravel, cobble, boulder or bedrock substrates (Eakins 2006, NatureServe 2006).

Black Redhorse – Three black redhorse were detected at two sites, 34 and 35, both boat electrofishing sites. Adult black redhorse typically inhabit medium-sized rivers characterized by riffle and pool habitats (Mandrak and Casselman 2004), and cool, clear well-oxygenated waters, with temperatures averaging 20°C during the summer (Parker 1989). This species is intolerant of high levels of siltation and turbidity (Bowman 1970).

Preferred substrates are sand, gravel, rubble and boulder (Bowman 1970, Parker 1989, Holm and Boehm 1998). Based on these features, Site 35 appears to be typical black redhorse habitat. The site was characterized as a riffle/run and the maximum sampling depth was 2 m. Substrate was described as mostly gravel (50%) and sand (30%), with some silt (20%). It is probable that Site 34 also has features consistent with preferred black redhorse habitat; however, as no substrate information was recorded, it is not possible to confirm this.

Northern Madtom – One northern madtom was detected at Site 42, a boat electrofishing site. The river at this site was described as 30 m in width with a maximum depth of 3.5 m (maximum depth sampled = 2 m). Flow rate was termed medium. No substrate information was recorded. Adult northern madtom are found in large creeks and rivers, and sometimes in lakes, in clear to turbid waters, over substrates of sand, gravel and rocks, occasionally with detritus, silt, debris, fallen logs, and are sometimes associated with aquatic vegetation (Etnier and Starnes 1993, Goodchild 1993, Holm and Mandrak 1998).

2004

Three SAR (eastern sand darter, greenside darter, northern madtom) were detected at 34 out of a possible 41 sites during the 2004 DFO survey of the lower Thames River. The most abundant was eastern sand darter with 519 specimens caught, followed by greenside darter with 201 specimens caught. Only one northern madtom was detected in 2004.

Eastern Sand Darter – The 2004 survey of the lower Thames River was, in part, a targeted survey for eastern sand darter as part of a separate tagging project. Therefore, areas that appeared to be suitable eastern sand darter habitat were selected for sampling (i.e. areas immediately downstream of river bends, in shallow, slow-moving water along sand bars on the depositional side of the river (Facey 1998)). The majority of eastern sand darter were captured in August (235) and September (188), while sampling in July detected the fewest (96). It is unclear why more than twice the number of eastern sand darter were detected in August compared to July. Water temperature and sampling depth were very similar in both months: the average water temperature was the 22.7°C in July and August (17.6°C in September) while the maximum sampling depth, on average, was 0.99 m in July and 1.03 m in August (1.18 m in September). The additional nine sites sampled in August do not explain the difference in numbers between July and August; of the 235 eastern sand darter detected in August, 228 were captured from the 32 sites sampled in all three months.

Greenside Darter – Thirty-nine greenside darter were caught at nine sites (seine net and boat electrofishing sites) in July, 90 were caught at 16 sites (seine net and boat electrofishing sites) in August and 72 were caught from 16 sites (seine net sites) in September (Table 9). With the exception of four sites (8a, 17a, 18 and 40a), this species was detected at sites where eastern sand darter was found as well (not necessarily during the same month). These sites were described as being mainly slow to medium riffles and/or runs with substrates dominated by coarser material such as sand, gravel and cobble, with some clay and silt (Appendix 27). This description appears to be consistent with typical greenside darter habitat (i.e. creeks and small- to medium-sized rivers over sand, gravel and/or cobble substrates (NatureServe 2006)).

Northern Madtom – One northern madtom was detected at Site 11a in August of 2004. This was a seine net site which was described as being a slow run with a maximum stream depth of 1.5 m and a maximum sampling depth of 1.1 m. The stream width at this site was approximately 25 m. Substrate consisted of a mixture of sand (50%), clay (40%) and silt (10%). This agrees with descriptions of northern madtom habitat, mentioned previously.

4.3.2 SAR and Sampling Gear

2003

In 2003, SAR in the lower Thames River were detected with both active (wadeable and non-wadeable sites) and passive gear types (non-wadeable sites) (Table 7), which included boat electrofishing (active), seine netting (active), small- and large-mesh fyke nets alone and in combination with minnow traps and Windermere traps (passive) and gill nets (passive). Overall, active gear types detected higher numbers of more species than passive gear types (Table 8). However, this could be a result of the higher number of sites sampled with the boat electrofishing unit (19 sites), which caught the most individuals and detected the most species of the active gear types used. Of the seven SAR detected during 2003, boat electrofishing caught six of them; the only species not detected with the boat electrofishing unit were the buffalo specimens (Table 7). Seine netting, the other active gear type that detected SAR, captured both eastern sand darter and greenside darter, but none of the larger species. This could be because larger species, such as the redhorse or buffalo, are more mobile than smaller species and are, therefore, able to avoid seine net hauls. Passive gear types, which were only used at non-wadeable sites, detected one SAR and one potential SAR: spotted sucker and buffalo sp. Gill nets were successful at detecting buffalo sp. as there were only two gill net sites and buffalo sp. were detected at both of them. Buffalo sp. were also caught using a large-mesh fyke net. Spotted sucker was detected with three different gear types (boat electrofishing, small-mesh fyke net and large-mesh fyke net), the most of any other SAR. Black redhorse, river redhorse and northern madtom seemed to have the highest level of gear specificity as they were only detected with the boat electrofishing unit.

2004

The boat electrofishing unit and seine nets were the only two gear types used to sample the lower Thames River in 2004 and two of the three SAR caught (eastern sand darter and greenside darter) were detected with both. However, seine netting appeared to be more efficient at catching large numbers of both species. Of the 17 sites sampled with both gear types in July and August, 11 eastern sand darter were caught with the boat electrofishing unit (10 in July, 1 in August) while 320 were caught using seine nets (86 in July, 234 in August) (Appendices 18, 19, 24, 25). A similar result was observed with greenside darter: seven specimens were caught using the boat electrofishing unit (5 in July, 2 in August), while 123 individuals were captured with seine nets (34 in July and 89 in August). This difference is likely due to the smaller size of the fishes; electrofishing tends to select for larger fishes as a result of total body voltage increasing with the length of the fish, while at the same time, smaller fishes that are not as mobile as large ones are probably less capable of avoiding the seine nets. The smaller size of eastern sand darter and greenside darter, combined with the turbid water of the lower Thames, also likely hinders the ability of netters on the electrofishing vessel to see and retrieve stunned individuals.

As only one northern madtom was detected in 2004, it is difficult to draw any type of conclusions about what the most efficient gear type may be at detecting this species. The single specimen observed in 2004 was caught with a straight seine net; however, during the 2003 survey of the lower Thames, the only northern madtom detected was captured with a boat electrofishing unit.

5.0 RECOMMENDATIONS

When using multiple gear types to survey sites in a standardized manner, it is important that sites are sampled at the same time or within days of each other with each gear type. This reduces the influence of confounding factors on the comparison (e.g. seasonal variation in fish assemblages and seasonal variation in fish and physical habitat). In studies comparing boat electrofishing to fyke nets and hoop nets, sampling using the various gear types was done within days of each other (Chow-Fraser *et al.* 2005, Pugh and Schramm 1998).

Also, to make valid comparisons of effort and CPUE data for sites sampled with multiple gear types, it is important that effort be the same or very similar among the gear types and CPUE should be recorded as the time it takes to obtain the sample i.e. fish/person-hours (Pugh and Schramm 1998).

Completed field sheets are very important when it comes to looking for trends in catch data (i.e. numbers caught, species caught) as well as habitat type and use, especially with regards to SAR. If data are not recorded completely, it is difficult to draw conclusions. Field sheets should be familiar to all involved in data collection and the importance of having them filled out completely and properly should be emphasized.

Future sampling on the lower Thames River should incorporate targeted sampling for river redhorse (Special Concern) as only two specimens were detected in 2003 and this was the first record of this species in the Thames. Targeted sampling should also be performed for the northern madtom (Endangered) to develop a better understanding of its population size and distribution.

6.0 ACKNOWLEDGEMENTS

Funding for this project was provided through the Interdepartmental Recovery Fund (IRF), the DFO SARCEP program and the Ontario Ministry of Natural Resources Canada-Ontario Agreement. Andrew Doolittle (DFO, Great Lakes Laboratory for Fisheries and Aquatic Sciences) provided the site maps. Special thanks to Jason Barnucz and all of the summer students involved in the sampling.

7.0 LITERATURE CITED

Bowman, M.L. 1970. Life history of the black redhorse, *Moxostoma duquesnei* (Lesueur), in Missouri. Transactions of the American Fisheries Society 3: 546-559.

Chow-Fraser, P., K. Kostuk, T. Seilheimer, M. Weimer, T. MacDougall, and T. Theÿsmeÿer. 2005. Effect of wetland quality on sampling bias associated with two fish survey methods for coastal wetlands of the lower Great Lakes. To be published in Simon, T.P. and P.M. Stewart (Eds). Coastal wetlands of the Laurentian Great Lakes: health, habitat and indicators. CRC Press. (in press)

CHRS (Canadian Heritage Rivers System). 2006. Canada's national river conservation program. Available: http://www.chrs.ca. (Accessed July 20, 2006).

Eakins, R.J. 2006. Ontario freshwater fishes life history database. On-line database. Available: http://www.fishdb.ca. (Accessed July 21, 2006).

Etnier, D.A. and W.C. Starnes. 1993. The fishes of Tennessee. University of Tennessee Press, Knoxville, Tennessee. 681 pp.

Facey, D.E. 1998. The status of the eastern sand darter, *Ammocrypta pellucida*, in Vermont. Canadian Field-Naturalist 112(4): 596-601.

Goodchild, C.D. 1993. Status of the northern madtom, *Noturus stig*mosus, in Canada. Canadian Field-Naturalist 107(4): 417-422.

Holm, E. and D. Boehm. 1998. Sampling for fishes at risk in southwestern Ontario. Unpublished report prepared by the Centre for Biodiversity and Conservation Biology, Royal Ontario Museum, for the Ontario Ministry of Natural Resources, Southcentral Region and Aylmer District. Revised 2001.

Holm, E. and N.E. Mandrak. 1998. Update COSEWIC status report on the northern madtom, *Noturus stigmosus*, in COSEWIC assessment and update status report on the northern madtom, *Noturus stigmosus*, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa, ON. 15 pp.

Mandrak, N.E. and S.M. Casselman. 2004. Black redhorse (*Moxostoma duquesnei*) critical habitat case study. Draft Canadian Science Advisory Secretariat Research Document.

Mandrak, N.E. and E.J. Crossman. 1992. A checklist of Ontario freshwater fishes annotated with distribution maps. Royal Ontario Museum Life Sciences Miscellaneous Publications. Toronto. 176 pp.

Mandrak, N.E. and B. Cudmore. 2006. COSEWIC assessment and update status report on the black buffalo, *Ictiobus niger*, in Canada. 2-month interim draft. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 30 pp.

NatureServe. 2006. NatureServe Explorer: an online encyclopedia of life. Version 5.0. NatureServe, Arlington, VA. Available: http://www.natureserve.org/explorer. (Accessed July 20, 2006).

Nelson, J.S., E.J. Crossman, H. Espinosa-Perez, L.T. Findley, C.R. Gilbert, R.N. Lea, and J.D. Williams. 2004. Common and scientific names of fishes from the United States, Canada, and Mexico. American Fisheries Society. Special Publication 29, Bethesda, MA. 386pp.

Parker, B.J. 1989. Status of the black redhorse, *Moxostoma duquesnei*, in Canada. Canadian Field-Naturalist 103(2): 175-179.

Pugh, L.L. and H.L. Schramm. 1998. Comparison of electrofishing and hoopnetting in lotic habitats of the lower Mississippi River. North American Journal of Fisheries Management 18: 649-656.

Scott, W.B. and E.J. Crossman. 1998. Freshwater fishes of Canada. Fisheries Research Board of Canada pp. 966.

Staton, S.K. and N.E. Mandrak. 2006. Focusing conservation efforts for freshwater biodiversity. Pp. 197-204, in: Protected areas and species and ecosystems at risk: research and planning challenges. Proceedings of the Parks Research Forum of Ontario (PRFO) and Carolinian Canada Coalition (CCC) Annual General Meeting May 5-7, 2005, University of Guelph. Guelph, ON.

Taylor, I., B. Cudmore, C.A. MacKinnon, S.E. Madzia and S.L. Hohn. 2004. Synthesis report for the Thames River recovery plan. Upper Thames River Conservation Authority. 6th Draft.

Table 1. Summary of catch data for bag seine and straight seine sites (wadeable sites) on the lower Thames River, 2003.

	Gear Type	
Catch Data	**Bag Seine**	**Straight Seine**
Number of Sites Sampled	3	6
Total Species Detected	17	30
Total Fishes Caught	459	2176
Average Number of Fishes Caught/Site	153	362.67
Minimum Fishes Caught/Site	103	38
Maximum Fishes Caught /Site	212	1179

Table 2. Summary of catch data for passive gear types used at non-wadeable sites on the lower Thames River, 2003. GN – gill net; LFN – large-mesh fyke net; MT – minnow trap; WT – Windermere trap; SFN – small-mesh fyke net.

	Gear Type				
Catch Data	**GN**	**LFN**	**LFN + MT + WT**	**LFN + MT**	**SFN**
Number of Sites Sampled	2	1	3	6	7
Total Species Detected	10	2	8	13	21
Total Fishes Caught	78	4	17	22	347
Average Number of Fishes Caught/Site	39	4	5.67	3.66	n/a
Minimum Fishes Caught/Site	23	4	1	2	6
Maximum Fishes Caught /Site	55	4	12	6	> 204

Table 3. Summary of catch data for active gear types used at non-wadeable sites on the lower Thames River, 2003.

	Gear Type		
Catch Data	**Boat Electrofishing**	**Boat Seine**	**Trawl Net**
Number of Sites Sampled	19	10	3*
Total Species Detected	39	30	15
Total Fishes Caught	> 3697	> 3076	1131
Average Number of Fishes Caught/Site	n/a	n/a	565.5
Minimum Fishes Caught/Site	32	63	147
Maximum Fishes Caught /Site	> 505	> 1313	984

*net snagged at third site, no fishes caught

Table 4. Summary of catch data for seine net sites (wadeable sites) on the lower Thames River July – September, 2004.

	Month Sampled		
Catch Data	**July**	**August**	**September**
Number of Sites Sampled	32	41	32
Total Species Detected	36	39	38
Total Fishes Caught	>2141	>2859	6628
Average Number of Fishes Caught/Site	n/a	n/a	207.12
Minimum Fishes Caught/Site	>7	0	27
Maximum Fishes Caught /Site	420	285	731

Table 5. Summary of catch data from seine net and backpack electrofishing sites (wadeable sites) in tributaries of the lower Thames River, 2004.

	Gear Type	
Catch Data	**Backpack Electrofishing**	**Seine Net**
Number of Sites Sampled	22	8
Total Species Detected	42	35
Total Fishes Caught	1931	1122
Average Number of Fishes Caught/Site	87.77	140.25
Minimum Fishes Caught/Site	27	10
Maximum Fishes Caught /Site	245	385

Table 6. Summary of catch data from boat electrofishing sites (non-wadeable) in the lower Thames River, July and August 2004.

	Month Sampled	
Catch Data	**July**	**August**
Number of Sites Sampled	17	26
Total Species Detected	29	32
Total Fishes Caught	455	683
Average Number of Fishes Caught/Site	26.75	26.23
Minimum Fishes Caught/Site	5	4
Maximum Fishes Caught /Site	81	82

Table 7. Species at risk detected in the lower Thames River, 2003 and 2004.

Legend	▨ Present	Absent

	2003			2004	
	Wadeable	Non-Wadeable		Wadeable	Non-Wadeable
Species	Active*	Active**	Passive***	Active*	Active*
black redhorse		▨			
buffalo sp.			▨		
eastern sand darter	▨	▨		▨	▨
greenside darter	▨	▨		▨	▨
northern madtom		▨		▨	
river redhorse		▨			
spotted sucker		▨	▨		

*straight seine

**boat electrofishing

***gill nets; small-mesh fyke nets; large-mesh fyke nets + minnow traps + Windermere traps

Table 8. Species at risk detected in the lower Thames River, 2003, by site and gear type.

Species	**Total**	**5 (GN)***	**6 (GN)**	**10 (LFN+MT +WT)**	**19a (SFN)**	**20b (BEF)**	**21a (LFN+MT)**	**30a (SFN)**	**34 (BEF)**	**35 (BEF)**	**39 (SSN)**	**41 (BEF)**	**42 (BEF)**	**43 (BEF)**	**44 (BEF)**	**45 (BEF)**	**47 (SSN)**	**50 (SSN)**	**51 (SSN)**
black redhorse	**5**								1	2			2						
buffalo sp.	**3**	1	1	1															
eastern sand darter	**12**										1		2	2	3	2		2	
greenside darter	**3**															1	1		1
northern madtom	**1**												1						
river redhorse	**2**											1		1					
spotted sucker	**6**				1	1	2	1		1									
Total	**32**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**3**	**1**	**1**	**5**	**3**	**3**	**3**	**1**	**2**	**1**

*Site number (gear type); GN – gill net; LFN + MT + WT – large-mesh fyke net + minnow trap + Windermere trap; SFN – small-mesh fyke net; BEF – boat electrofishing; LFN + MT – large-mesh fyke net + minnow trap; SSN – straight seine.

Table 9. Species at risk detected in the lower Thames River, 2004, by site. Seine net sites: 1a, 2a, 4a – 17a, 18 – 32, 33a, 36a, 39a and 40a. Boat electrofishing sites: 1b, 2b, 4b, 5b, 7b, 9b, 10b, 14b and15b.

	Eastern Sand Darter				Greenside Darter				Northern Madtom			
Site	**July**	**Aug.**	**Sept.**	**Total**	**July**	**Aug.**	**Sept.**	**Total**	**July**	**Aug.**	**Sept.**	**Total**
1a	8	12	3	**23**		1	3	**4**				
1b					2			**2**				
2a	4	1		**5**		1		**1**				
2b	1			**1**	1			**1**				
4a		3	4	**7**	3		1	**4**				
4b	1	1		**2**	1			**1**				
5a	6	7	6	**19**								
5b	1			**1**		1		**1**				
6a	1	3	5	**9**	2	6	4	**12**				
7a		1		**1**	1		1	**2**				
7b					1			**1**				
8a							4	**4**				
9a	2	4		**6**		1	3	**4**				
9b	3			**3**								
10a	7	2	2	**11**								
10b	1			**1**								
11a	3	30		**33**						1		**1**
12a		4	4	**8**								
13a	5	14	3	**22**		1		**1**				
14a	10	10	76	**96**		1		**1**				
14b						1		**1**				
15a	11	4	45	**60**		1	6	**7**				
15b	3			**3**								
16a	5	1	6	**12**	6	3		**9**				
17a							5	**5**				
18							1	**1**				
19	7	1		**8**	11	29	4	**44**				
20	3	31	1	**35**	8	13	20	**41**				
21	3		7	**10**								
22		1	2	**3**		3	3	**6**				
23	1			**1**		1	4	**5**				
24			1	**1**								
25			4	**4**	3		7	**10**				
26	7		11	**18**								
27		51		**51**		21	4	**25**				
28	1	19	1	**21**		6		**6**				
29		1	4	**5**								
30	2	18		**20**								
32		9	3	**12**			2	**2**				
33a		3		**3**								
36a		1		**1**								
39a		3		**3**								
40a						1		**1**				
Total	**96**	**235**	**188**	**519**	**39**	**90**	**72**	**201**		**1**		**1**

Table 10. Species detected at bag seine and straight seine sites on the lower Thames River, 2003.

Species	Bag Seine	Straight Seine
blackside darter	▨	▨
bluntnose minnow	▨	▨
brindled madtom		▨
central stoneroller		▨
channel catfish	▨	▨
common carp		▨
common shiner		▨
creek chub	▨	▨
eastern sand darter		▨
emerald shiner	▨	▨
ghost shiner	▨	▨
gizzard shad	▨	▨
golden redhorse	▨	▨
greenside darter		▨
johnny darter	▨	▨
logperch		▨
mimic shiner		▨
mooneye		▨
northern hog sucker		▨
quillback		▨
rock bass	▨	▨
shorthead redhorse	▨	▨
silver redhorse		▨
smallmouth bass		▨
spotfin shiner	▨	▨
stonecat	▨	▨
troutperch	▨	▨
white perch	▨	▨
white sucker	▨	▨
yellow perch	▨	▨
Total Species	17	30
Unique Species	0	13
Common Species	17	
Total Species Richness	30	

Legend	▨ Present	Absent

Table 11. Species detected at non-wadeable sites in the lower Thames River, with active and passive gear types, 2003. BEF – boat electrofishing; BS – boat seine; T – trawl; GN – gill net; LFN – large-mesh fyke net; MT – minnow trap; WT – Windermere trap; SFN – small-mesh fyke net.

	Active Gear Types			Passive Gear Types				
Species	**BEF**	**BS**	**T**	**GN**	**LFN**	**LFN + MT + WT**	**LFN + MT**	**SFN**
black crappie	▨						▨	▨
black redhorse	▨							
blackside darter	▨							
bluegill	▨					▨		▨
bluntnose minnow	▨	▨						
brindled madtom		▨					▨	
brook silverside	▨		▨					
brown bullhead		▨	▨		▨	▨		▨
buffalo sp.				▨		▨		
channel catfish	▨	▨	▨	▨		▨	▨	▨
common carp	▨	▨	▨				▨	▨
eastern sand darter	▨							
emerald shiner	▨	▨						▨
freshwater drum	▨	▨	▨	▨	▨	▨	▨	▨
ghost shiner	▨	▨	▨					
gizzard shad	▨	▨	▨					▨
golden redhorse	▨	▨						
greater redhorse	▨							
greenside darter	▨							
johnny darter	▨	▨						
largemouth bass	▨	▨						▨
logperch	▨	▨						
longnose gar		▨		▨				▨
mimic shiner	▨							
mooneye	▨	▨	▨					
northern hog sucker	▨							
northern madtom	▨							
northern pike				▨				▨
pumpkinseed	▨	▨						▨
quillback	▨	▨						
river redhorse	▨							
rock bass	▨	▨				▨	▨	▨
round goby		▨	▨				▨	
shorthead redhorse	▨	▨		▨			▨	▨
silver redhorse	▨	▨						
smallmouth bass	▨	▨					▨	
spotfin shiner	▨	▨						▨
spottail shiner		▨	▨			▨		
spotted sucker	▨						▨	▨
stonecat	▨							
troutperch	▨	▨	▨					
walleye			▨					
white bass	▨	▨	▨	▨			▨	▨
white crappie	▨	▨	▨	▨		▨	▨	▨
white perch	▨	▨		▨			▨	▨
white sucker	▨	▨						
yellow bullhead	▨							▨
yellow perch		▨	▨	▨				▨
Total Species	39	30	15	10	2	8	13	21
Unique Species	14	2	1	0	0	1	3	6
Common Species	29			16				
Total Species Richness	46			26				

Legend	▨ Present	Absent

Table 12. Species detected at nine sites sampled with both passive (small-mesh fyke net, large-mesh fyke net alone and in combination with minnow traps) and active (boat electrofishing) gear types, lower Thames River, 2003.

Species	Active	Passive
black crappie	▨	
brindled madtom		▨
brook silverside	▨	
brown bullhead		▨
channel catfish	▨	▨
common carp	▨	▨
emerald shiner	▨	
freshwater drum	▨	▨
ghost shiner	▨	
gizzard shad	▨	▨
golden redhorse	▨	
largemouth bass	▨	
longnose gar		▨
pumpkinseed	▨	
rock bass		▨
round goby		▨
shorthead redhorse	▨	▨
silver redhorse	▨	
smallmouth bass	▨	▨
spotted sucker	▨	▨
white bass	▨	▨
white crappie	▨	▨
white perch		▨
yellow bullhead		▨
yellow perch		▨
Total	**17**	**17**
Unique Species	**8**	**8**
Common Species	**9**	
Total Species Richness	**25**	

Legend	▨ Present	Absent

Table 13. Catch data from lower Thames River sites sampled with both active (boat electrofishing) and passive (fyke net combinations) gear types, 2003. See Figure 1 for location of sites.

Species	Total	19a	19b	20a	20b	21a	21b	22a	22b	23a	23b	24a	24b	28a	28b	30a	30b	32a	32b
black crappie	**1**				1														
brindled madtom	**2**							2											
brook silverside	**1**		1																
brown bullhead	**1**													1					
channel catfish	**8**	2			1			1		1						2		1	
common carp	**25**	1	2		4				5	1	1	2	4		2	1		1	1
emerald shiner	**10**						2												8
freshwater drum	**20**	1	2	1		1	2			2			2	3	1	1	3	1	
ghost shiner	**3**																		3
gizzard shad	**2411+**	2	300+		150+		300+		150+		500+		300+		300+	9	300+		100+
golden redhorse	**2**		1																1
largemouth bass	**5**		1				2				1				1				
longnose gar	**1**															1			
pumpkinseed	**1**										1								
rock bass	**4**					1				1						2			
round goby	**1**			1															
shorthead redhorse	**11**	3	1		1		1		1				1		1	2			
silver redhorse	**4**		1		1								1		1				
smallmouth bass	**5**		1	1			1		1				1						
spotted sucker	**5**	1			1	2										1			
white bass	**25**			1	10		1		5		2		1		2	2	1		
white crappie	**5**	3			1											1			
white perch	**2**									1						1			
yellow bullhead	**1**	1																	
yellow perch	**1**	1																	
Total	**>2555**	**15**	**>310**	**4**	**>170**	**4**	**>309**	**3**	**>162**	**6**	**>505**	**2**	**>310**	**4**	**>308**	**23**	**>304**	**3**	**>113**

Table 14. Species detected at seine net sites in the lower Thames River, 2004. Comparable sites are those sites with completed catch data for each month sampled.

	All Sites			Comparable Sites		
Species	**July**	**August**	**September**	**July**	**August**	**September**
black crappie	▨		▨			▨
blacknose dace	▨		▨	▨		▨
blackside darter	▨	▨	▨	▨	▨	▨
bluntnose minnow	▨	▨	▨	▨	▨	▨
brindled madtom		▨				
brook stickleback	▨	▨			▨	
central stoneroller	▨	▨	▨	▨	▨	▨
channel catfish	▨	▨	▨		▨	▨
common carp		▨				
common shiner	▨	▨	▨	▨	▨	▨
creek chub	▨	▨	▨	▨	▨	▨
eastern sand darter	▨	▨	▨	▨	▨	▨
emerald shiner	▨	▨	▨	▨	▨	▨
fantail darter			▨			
fathead minnow	▨	▨	▨	▨	▨	
ghost shiner			▨			▨
gizzard shad		▨	▨		▨	▨
golden redhorse	▨	▨	▨	▨	▨	▨
golden shiner			▨			▨
goldfish		▨			▨	
green sunfish	▨	▨		▨	▨	
greenside darter	▨	▨	▨	▨	▨	▨
hornyhead chub			▨			▨
johnny darter	▨	▨	▨	▨	▨	▨
largemouth bass		▨	▨			
logperch	▨	▨	▨	▨	▨	▨
longnose dace	▨					
longnose gar	▨	▨		▨	▨	
mimic shiner	▨	▨	▨	▨	▨	▨
northern hog sucker	▨	▨	▨	▨	▨	▨
northern madtom		▨				
pumpkinseed	▨	▨	▨	▨	▨	▨
quillback	▨		▨	▨		▨
rainbow darter	▨	▨	▨			
rock bass	▨	▨	▨	▨	▨	▨
rosyface shiner	▨	▨	▨	▨	▨	▨
round goby		▨				
shorthead redhorse			▨			
silver redhorse	▨	▨	▨	▨	▨	
smallmouth bass	▨	▨	▨	▨	▨	▨
spotfin shiner	▨	▨	▨	▨	▨	▨
spottail shiner		▨			▨	
stonecat	▨	▨	▨			
striped shiner	▨	▨	▨	▨	▨	▨
troutperch	▨	▨	▨	▨		▨
white crappie	▨	▨				
white perch	▨	▨	▨			
white sucker	▨	▨	▨	▨	▨	▨
yellow perch	▨		▨	▨		▨
Total Species	**36**	**39**	**38**	**28**	**29**	**30**
Unique Species	**1**	**6**	**5**	**0**	**3**	**4**
Common Species	**37**			**30**		
Total Species Richness	**49**			**37**		

Legend	▨ Present	Absent

Table 15. Species detected at backpack electrofishing and seine net sites in tributaries of the lower Thames River, 2004. BPEF – backpack electrofishing; SN – seine net.

Species	BPEF	SN
black bullhead	▨	
black crappie		▨
blacknose dace	▨	
blackside darter	▨	▨
bluegill	▨	▨
bluntnose minnow	▨	▨
brook stickleback	▨	▨
brown bullhead	▨	
central mudminnow	▨	▨
central stoneroller	▨	
channel catfish		▨
common carp	▨	▨
common shiner	▨	▨
creek chub	▨	▨
emerald shiner	▨	▨
fantail darter	▨	
fathead minnow	▨	▨
ghost shiner		▨
gizzard shad	▨	▨
golden shiner	▨	▨
goldfish	▨	
grass pickerel	▨	▨
green sunfish	▨	▨
greenside darter	▨	
Iowa darter	▨	
johnny darter	▨	▨
largemouth bass	▨	▨
least darter	▨	
logperch	▨	▨
longnose gar		▨
mimic shiner		▨
northern hog sucker	▨	
northern pike	▨	▨
northern redbelly dace	▨	▨
pumpkinseed	▨	▨
quillback	▨	▨
rainbow trout	▨	
rock bass	▨	▨
round goby		▨
shorthead redhorse	▨	
smallmouth bass	▨	
spotfin shiner	▨	▨
stonecat	▨	
tadpole madtom	▨	▨
tubenose goby	▨	
white crappie		▨
white perch		▨
white sucker	▨	▨
yellow bullhead	▨	▨
yellow perch	▨	▨
Total Species	42	35
Unique Species	15	8
Common Species	27	
Total Species Richness	50	

Legend	▨ Present	Absent

Table 16. Species detected at boat electrofishing sites in the lower Thames River, 2004. Comparable sites are those sites with completed catch data for July and August.

	All Sites		Comparable Sites	
Species	**July**	**August**	**July**	**August**
blackside darter	▨	▨	▨	▨
bluntnose minnow	▨	▨	▨	▨
brook silverside		▨		
central stoneroller		▨		▨
channel catfish	▨	▨	▨	▨
common carp	▨	▨	▨	▨
eastern sand darter	▨	▨	▨	
emerald shiner	▨	▨	▨	▨
fathead minnow	▨		▨	
freshwater drum	▨	▨	▨	▨
gizzard shad		▨		▨
golden redhorse	▨	▨	▨	▨
green sunfish	▨		▨	
greenside darter	▨	▨	▨	▨
johnny darter	▨	▨	▨	▨
largemouth bass	▨	▨	▨	
logperch	▨	▨	▨	▨
longnose gar	▨	▨	▨	
mimic shiner	▨	▨	▨	▨
mooneye		▨		
northern hog sucker	▨	▨	▨	▨
pumpkinseed	▨	▨	▨	
rainbow darter	▨		▨	
rainbow trout		▨		
rock bass	▨	▨	▨	▨
shorthead redhorse	▨	▨	▨	▨
silver redhorse	▨	▨	▨	▨
smallmouth bass	▨	▨	▨	▨
spotfin shiner	▨	▨	▨	▨
stonecat		▨		▨
troutperch	▨		▨	
walleye		▨		▨
white bass	▨	▨		▨
white perch	▨	▨	▨	▨
white sucker	▨	▨	▨	▨
yellow perch	▨	▨	▨	
Total Species	29	32	28	24
Unique Species	4	7	12	8
Common Species	25		19	
Total Species Richness	36		39	

Legend	▨ Present	Absent

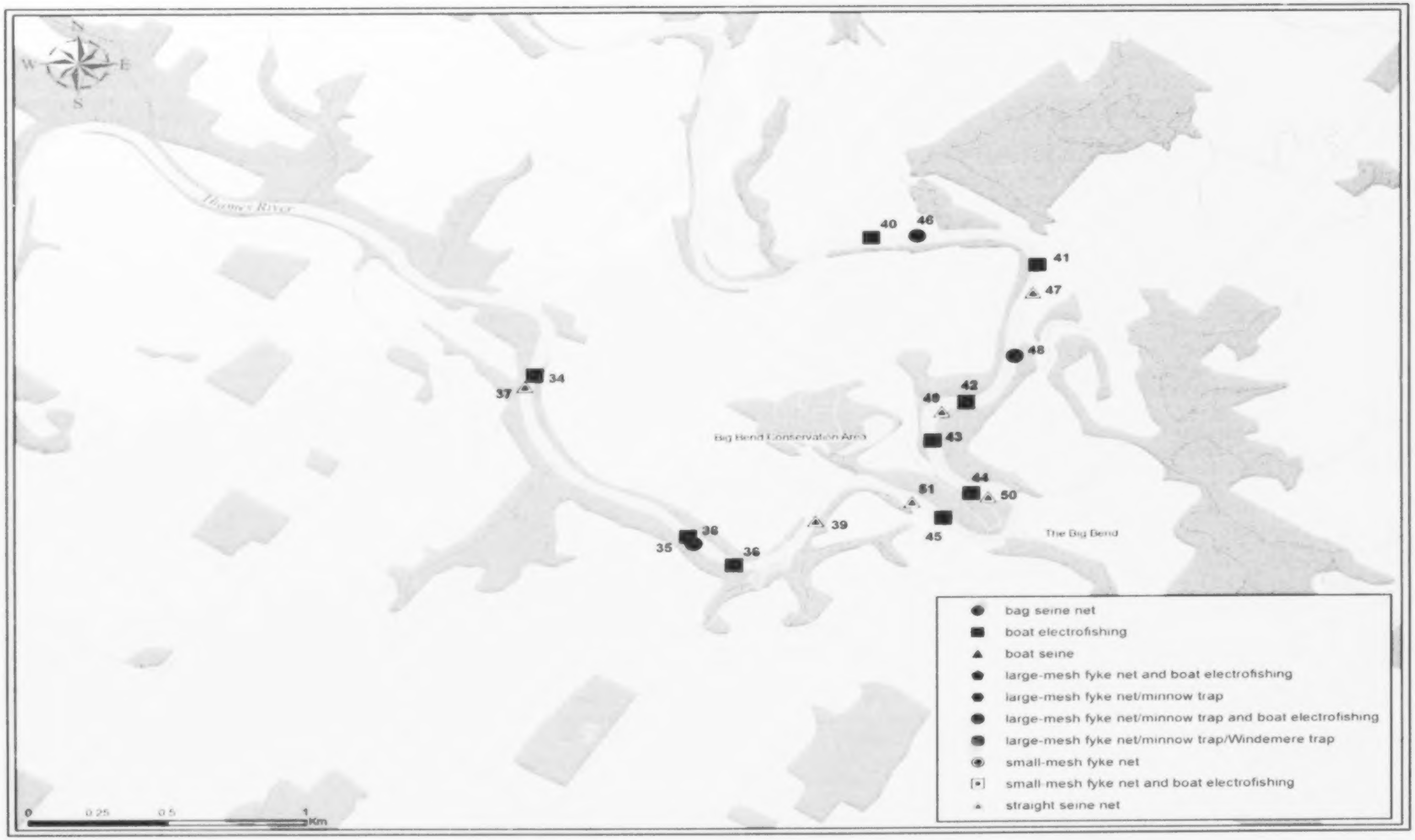

N
W
E
S
Thames River
40
46
41
47
48
34
37
42
49
43
Big Bend Conservation Area
44
51
50
45
39
38
35
36
The Big Bend
● bag seine net
■ boat electrofishing
▲ boat seine
● large-mesh fyke net and boat electrofishing
● large-mesh fyke net/minnow trap
● large-mesh fyke net/minnow trap and boat electrofishing
● large-mesh fyke net/minnow trap/Windemere trap
◉ small-mesh fyke net
[•] small-mesh fyke net and boat electrofishing
▲ straight seine net
0
0.25
0.5
1
Km

Figure 1. Sites sampled on the lower Thames River in 2003. Numbers on the map correspond to site codes in Appendix 2.

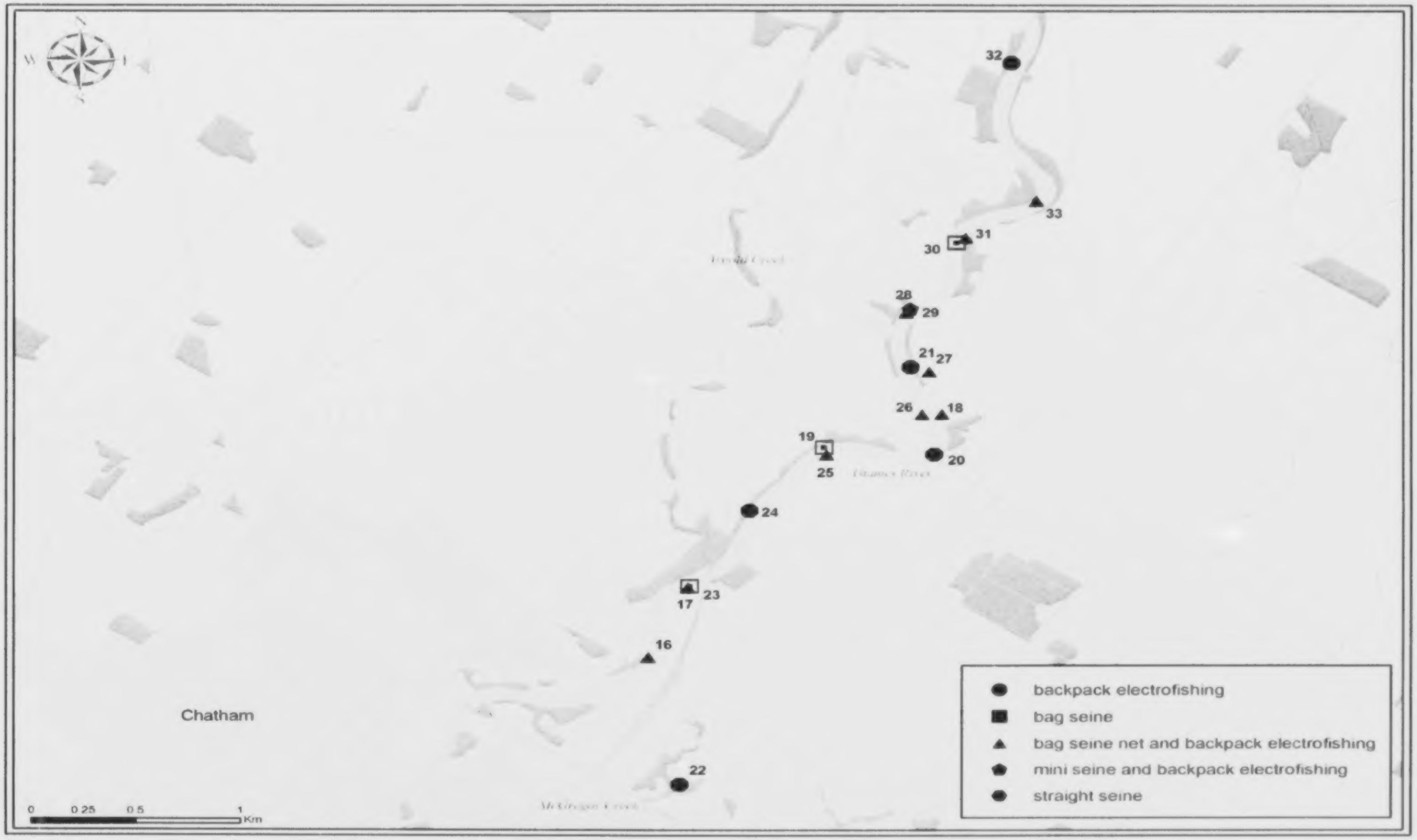
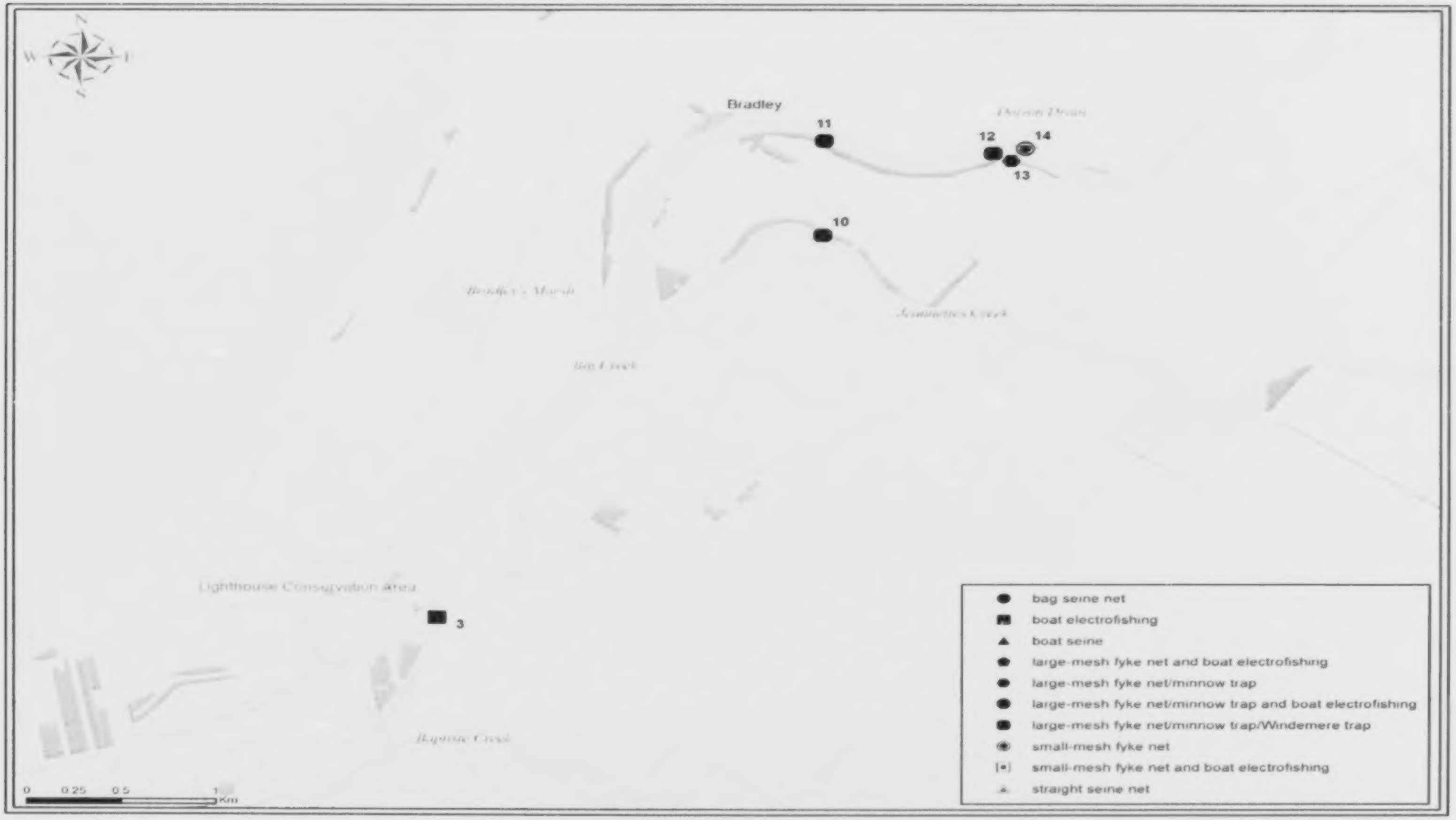
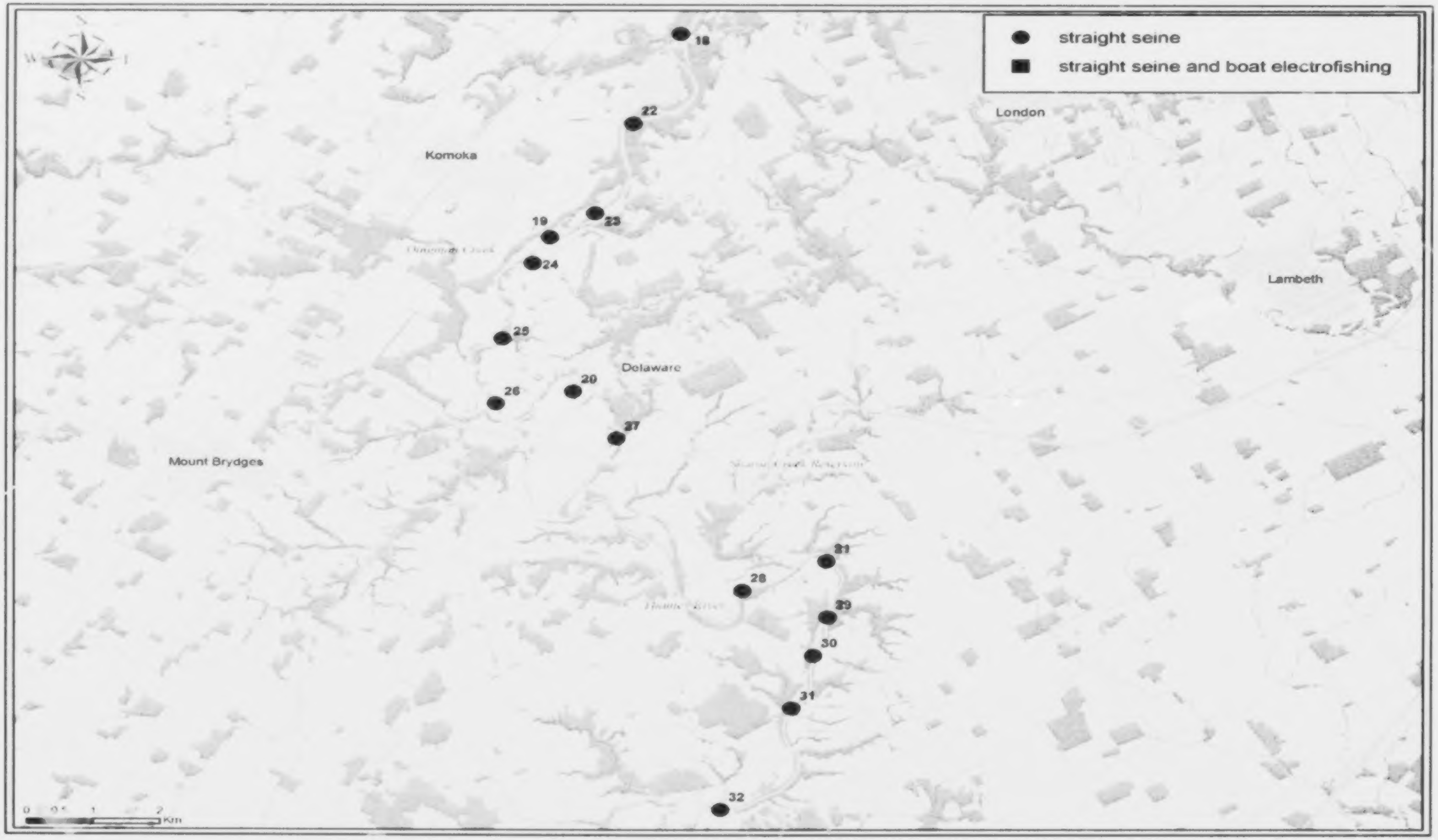

N
W
E
S
32
33
31
30
28
29
21
27
26
18
19
25
20
Thames River
24
23
17
16
Chatham
22
McGregor Creek
0
0.25
0.5
1
Km
● backpack electrofishing
■ bag seine
▲ bag seine net and backpack electrofishing
⬟ mini seine and backpack electrofishing
● straight seine

Figure 2. Sites sampled on the lower Thames River in 2003. Numbers on the map correspond to site codes in Appendix 2.



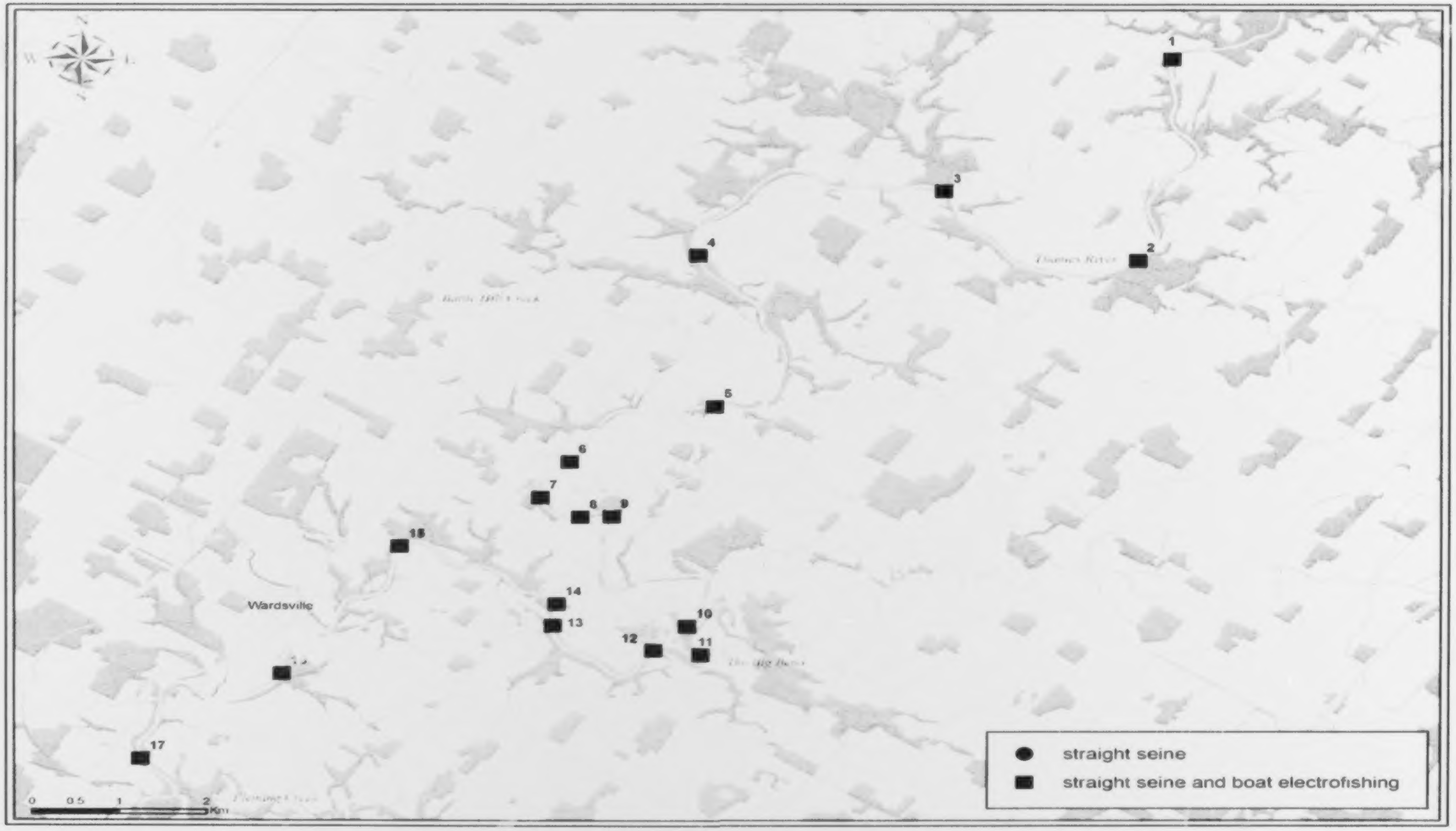
N
S
W
E
Bradley
11
12
14
13
10
Bradley's Marsh
Jeannettes Creek
Lighthouse Conservation Area
3
Baptiste Creek
0
0.25
0.5
1
Km
● bag seine net
■ boat electrofishing
▲ boat seine
● large-mesh fyke net and boat electrofishing
● large-mesh fyke net/minnow trap
● large-mesh fyke net/minnow trap and boat electrofishing
● large-mesh fyke net/minnow trap/Windemere trap
◉ small-mesh fyke net
[•] small-mesh fyke net and boat electrofishing
▲ straight seine net

Figure 3. Sites sampled on the lower Thames River in 2003. Numbers on the map correspond to site codes in Appendix 2.



● straight seine
■ straight seine and boat electrofishing
London
Komoka
Lambeth
Delaware
Mount Brydges
18
22
23
19
24
25
20
26
27
21
28
29
30
31
32
0 0.5 1 2 Km

Figure 4. Sites sampled on the lower Thames River in 2004. Numbers on the map correspond to site codes in Appendix 3.



N
E
S
W
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
17
Thames River
Wardsville
0
0.5
1
2
Km
● straight seine
■ straight seine and boat electrofishing

Figure 5. Sites sampled on the lower Thames River in 2004. Numbers on the map correspond to site codes in Appendix 3.

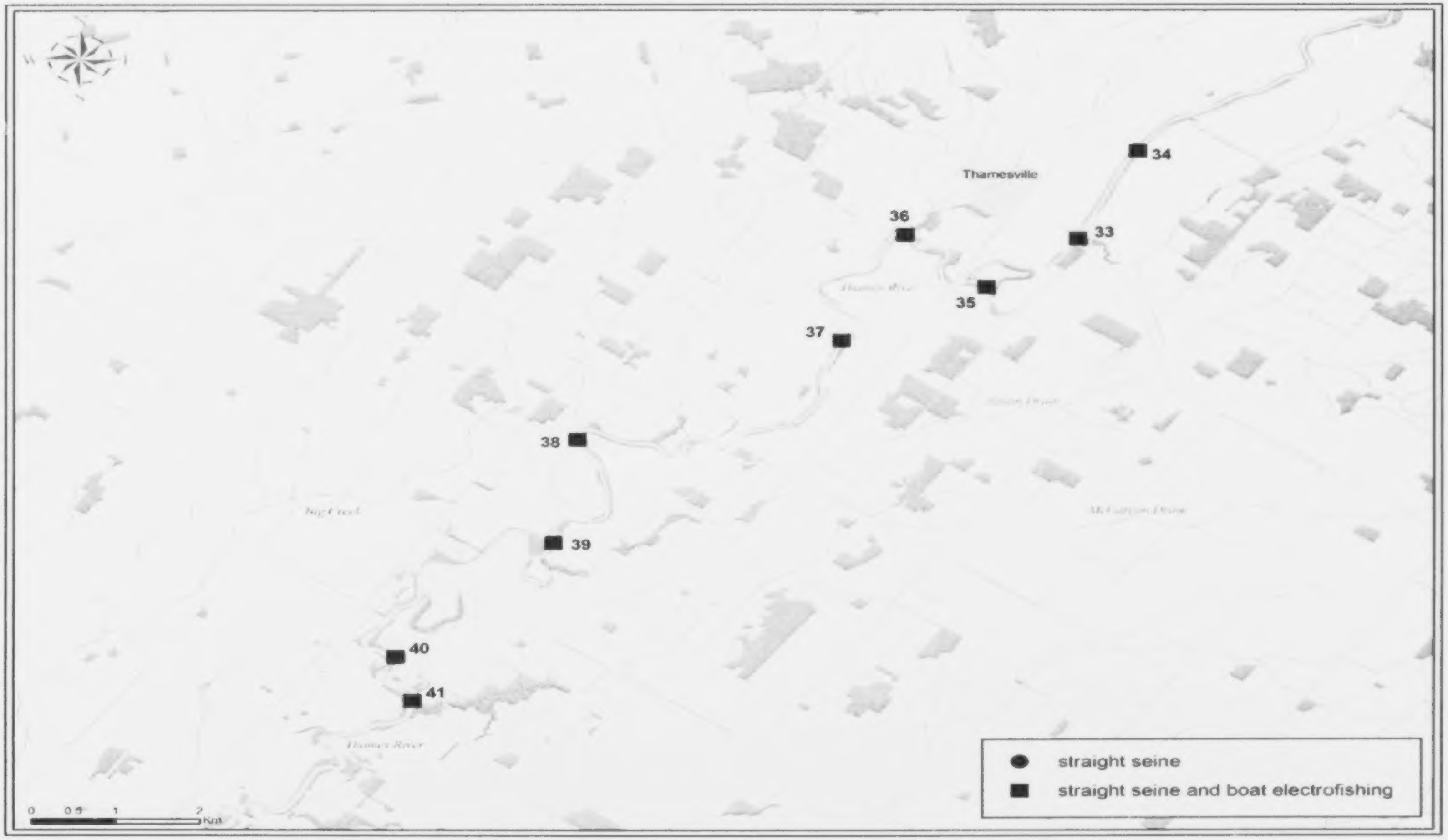

34
Thamesville
36
33
35
37
38
39
40
41
Thames River
● straight seine
■ straight seine and boat electrofishing
0
0.5
1
2
Km

Figure 6. Sites sampled on the lower Thames River in 2004. Numbers on the map correspond to site codes in Appendix 3.

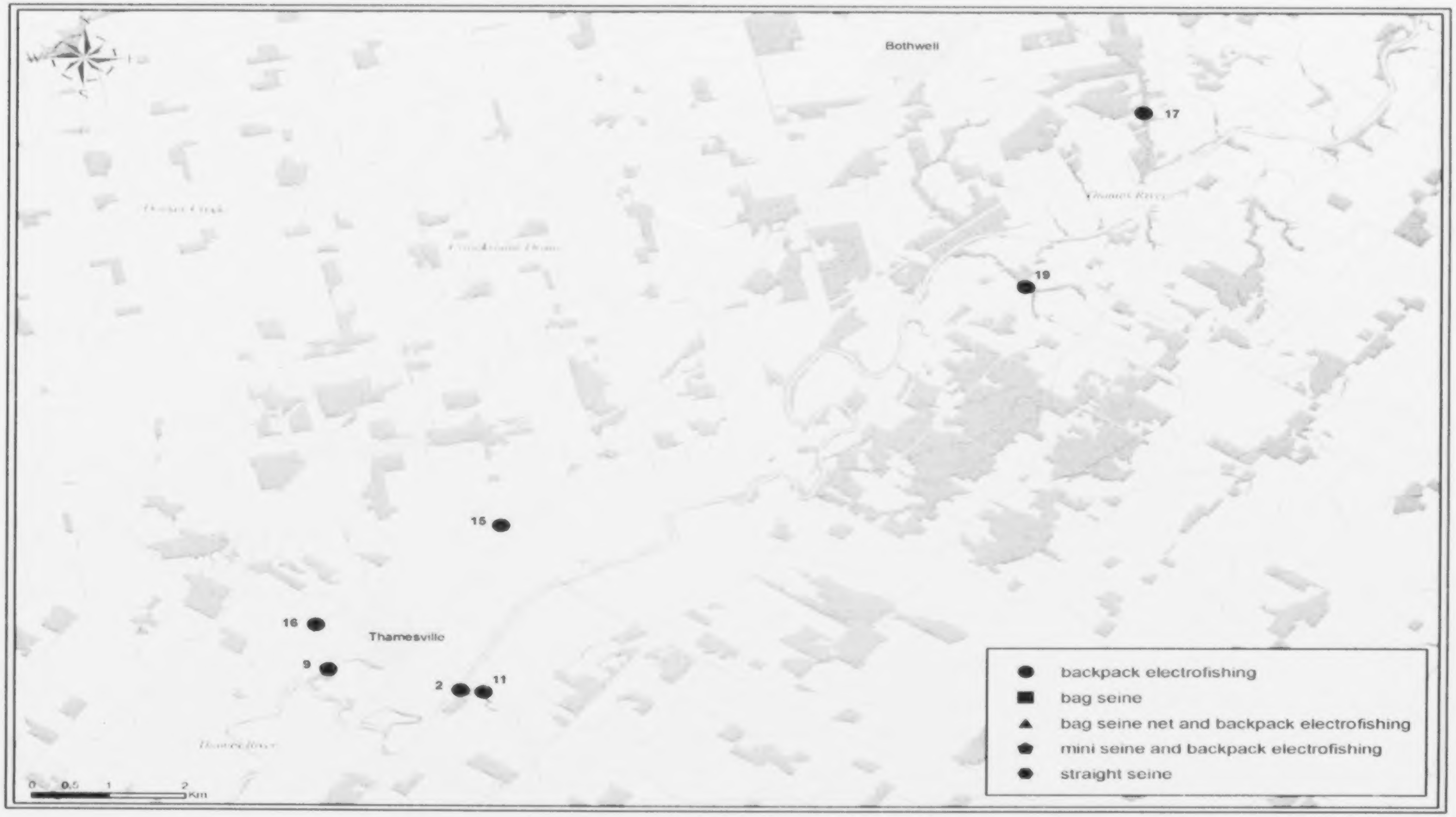

N
W
E
S
Bothwell
17
19
15
16
Thamesville
9
2
11
● backpack electrofishing
■ bag seine
▲ bag seine net and backpack electrofishing
⬟ mini seine and backpack electrofishing
⬢ straight seine
0
0.5
1
2
Km

Figure 7. Sites sampled on tributaries of the lower Thames River in 2004. Numbers on the map correspond to site codes in Appendix 4.

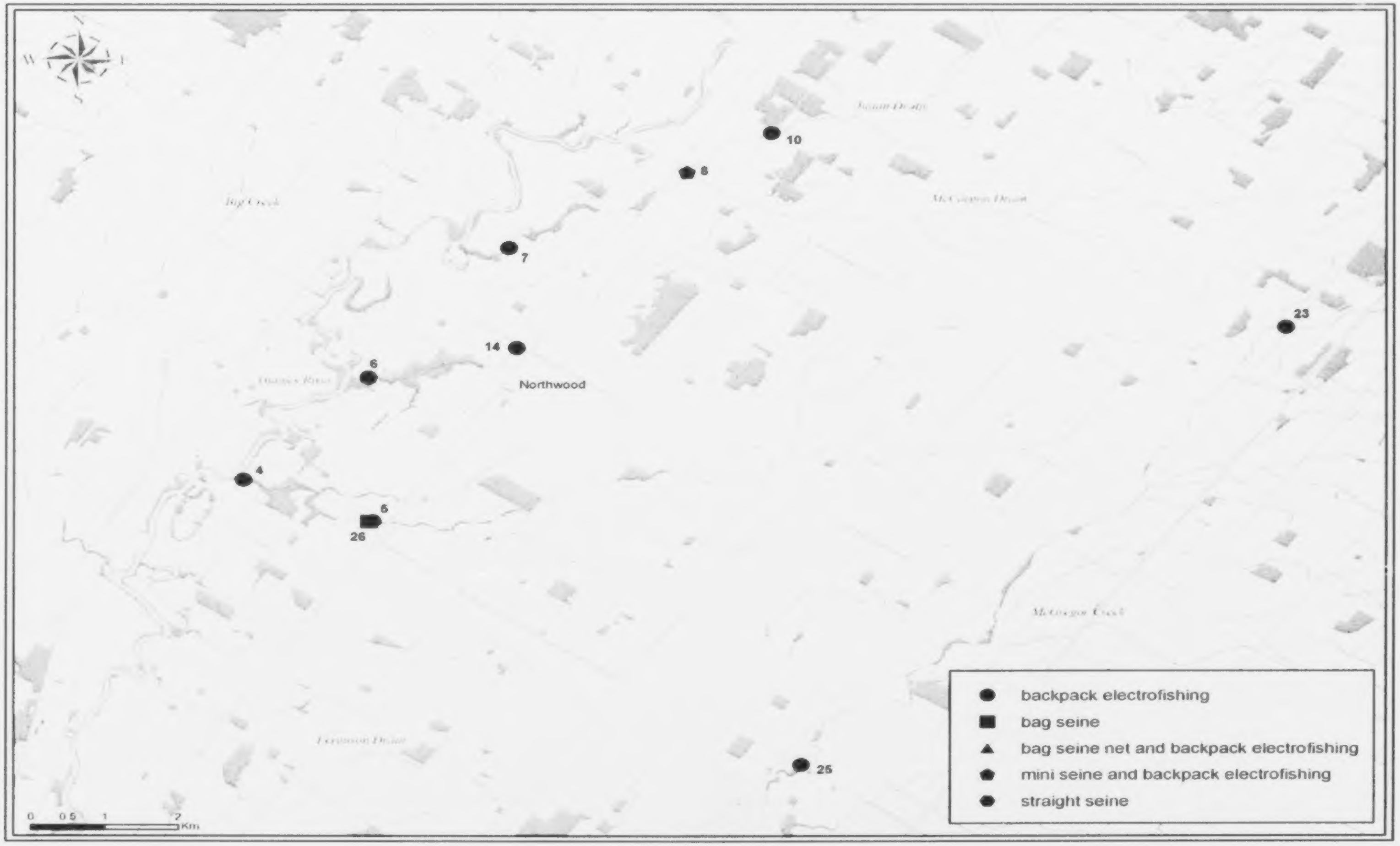

N
W
E
S
Big Creek
Thames River
Northwood
McGregor Creek
10
8
7
14
6
23
4
5
26
25
● backpack electrofishing
■ bag seine
▲ bag seine net and backpack electrofishing
⬟ mini seine and backpack electrofishing
⬢ straight seine
0
0.5
1
2
Km

Figure 8. Sites sampled in tributaries of the lower Thames River in 2004. Numbers on the map correspond to site codes in Appendix 4.

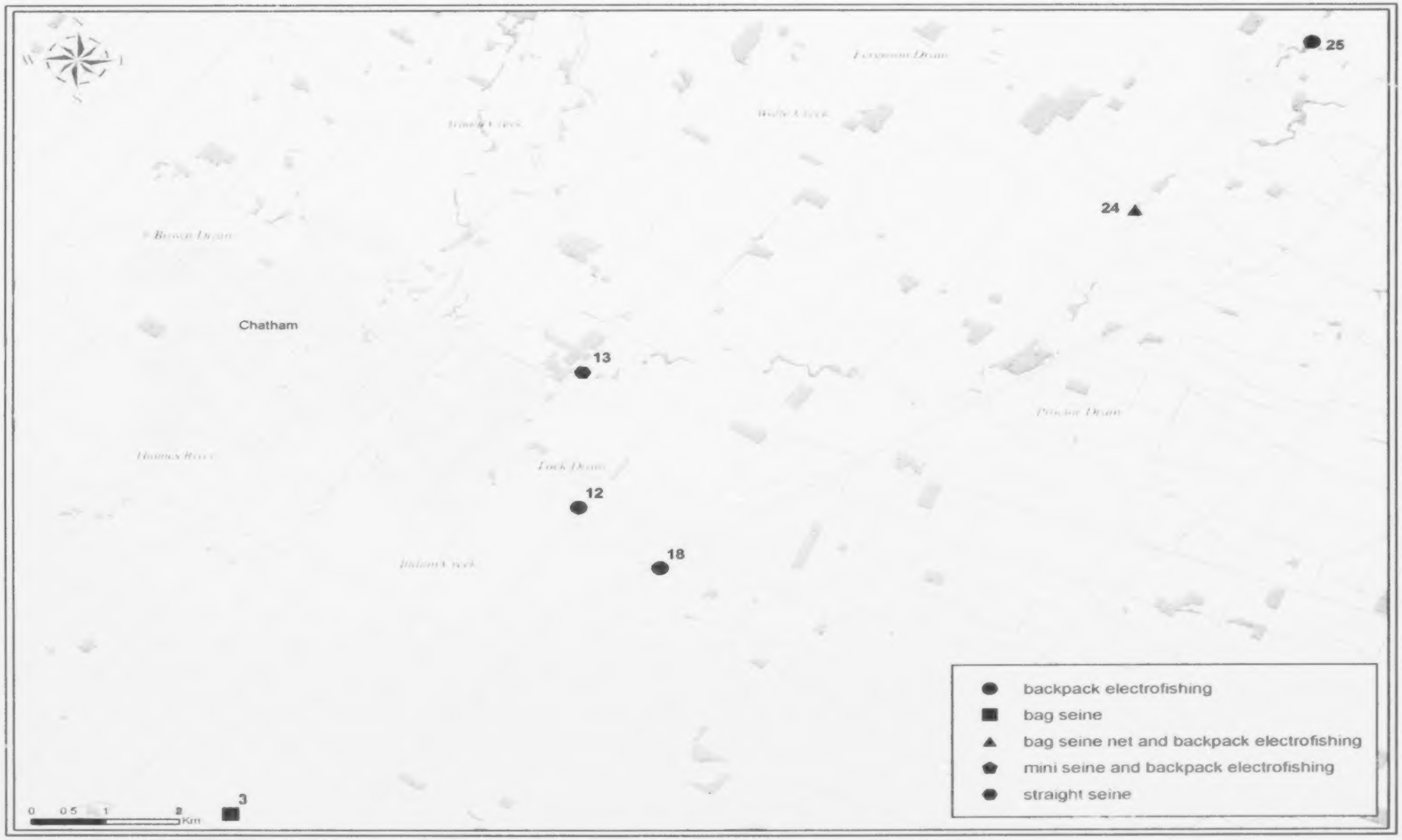
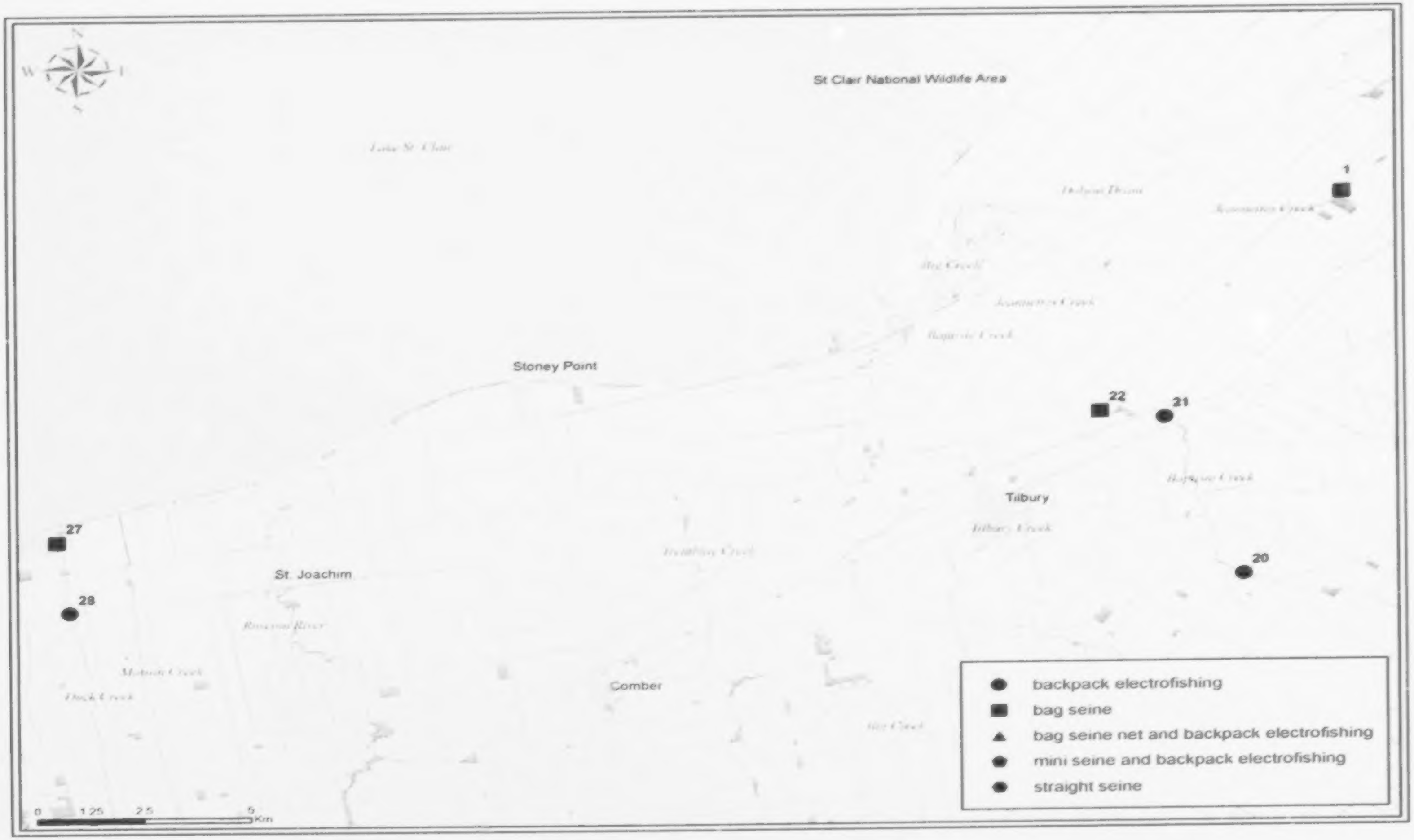

N
W
E
S
Ferguson Drain
25
24
Brown Drain
Chatham
13
Thames River
12
18
Indian Creek
3
0
0.5
1
2
Km
● backpack electrofishing
■ bag seine
▲ bag seine net and backpack electrofishing
⬟ mini seine and backpack electrofishing
⬢ straight seine

Figure 9. Sites sampled in tributaries of the lower Thames River in 2004. Numbers on the map correspond to site codes in Appendix 4.



N
W
E
S
St Clair National Wildlife Area
Lake St. Clair
1
Big Creek
Stoney Point
22
21
Tilbury
Tilbury Creek
27
St. Joachim
20
28
Ruscom River
Duck Creek
Comber
● backpack electrofishing
■ bag seine
▲ bag seine net and backpack electrofishing
● mini seine and backpack electrofishing
● straight seine
0
1.25
2.5
5
Km

Figure 20. Sites sampled in tributaries of the lower Thames River in 2004. Numbers on the map correspond to site codes in Appendix 4.

Appendix 1. Common and scientific names of species detected in the lower Thames River and its tributaries in 2003 and 2004 (according to Nelson *et al.* 2004).

Common Name	Scientific Name
black bullhead	*Ameiurus melas*
black crappie	*Pomoxis nigromaculatus*
black redhorse	*Moxostoma duquesnei*
blacknose dace	*Rhinichthys atratulus*
blackside darter	*Percina maculata*
bluegill	*Lepomis macrochirus*
bluntnose minnow	*Pimephales notatus*
brindled madtom	*Noturus miurus*
brook silverside	*Labidesthes sicculus*
brook stickleback	*Culaea inconstans*
brown bullhead	*Ameiurus nebulosus*
buffalo sp.	*Ictiobus* sp.
central mudminnow	*Umbra limi*
central stoneroller	*Campostoma anomalum*
channel catfish	*Ictalurus punctatus*
common carp	*Cyprinus carpio*
common shiner	*Luxilus cornutus*
creek chub	*Semotilus atromaculatus*
eastern sand darter	*Ammocrypta pellucida*
emerald shiner	*Notropis atherinoides*
fantail darter	*Etheostoma flabellare*
fathead minnow	*Pimephales promelas*
freshwater drum	*Aplodinotus grunniens*
ghost shiner	*Notropis buchanani*
gizzard shad	*Dorosoma cepedianum*
golden redhorse	*Moxostoma erythrurum*
golden shiner	*Notemigonus crysoleucas*
goldfish	*Carassius auratus*
grass pickerel	*Esox americanus vermiculatus*
greater redhorse	*Moxostoma valenciennesi*
green sunfish	*Lepomis cyanellus*
greenside darter	*Etheostoma blennioides*
hornyhead chub	*Nocomis biguttatus*
Iowa darter	*Etheostoma exile*
johnny darter	*Etheostoma nigrum*
largemouth bass	*Micropterus salmoides*
least darter	*Etheostoma microperca*
logperch	*Percina caprodes*
longnose dace	*Rhinichthys cataractae*
longnose gar	*Lepisosteus osseus*
mimic shiner	*Notropis volucellus*
mooneye	*Hiodon tergisus*
northern hog sucker	*Hypentelium nigricans*
northern madtom	*Noturus stigmosus*
northern pike	*Esox lucius*
pumpkinseed	*Lepomis gibbosus*
quillback	*Carpiodes cyprinus*

Appendix 1. Continued.

Common Name	Scientific Name
rainbow darter	*Etheostoma caeruleum*
rainbow trout	*Oncorhynchus mykiss*
river redhorse	*Moxostoma carinatum*
rock bass	*Ambloplites rupestris*
rosyface shiner	*Notropis rubellus*
round goby	*Neogobius melanostomus*
shorthead redhorse	*Moxostoma macrolepidotum*
silver redhorse	*Moxostoma anisurum*
smallmouth bass	*Micropterus dolomieu*
spotfin shiner	*Cyprinella spiloptera*
spottail shiner	*Notropis hudsonius*
spotted sucker	*Minytrema melanops*
stonecat	*Noturus flavus*
striped shiner	*Luxilus chrysocephalus*
tadpole madtom	*Noturus gyrinus*
troutperch	*Percopsis omiscomaycus*
tubenose goby	*Proterorhinus marmoratus*
walleye	*Sander vitreus*
white bass	*Morone chrysops*
white crappie	*Pomoxis annularis*
white perch	*Morone americana*
white sucker	*Catostomus commersonii*
yellow bullhead	*Ameiurus natalis*
yellow perch	*Perca flavescens*

Appendix 2. 2003 lower Thames River site descriptions.

Site	Latitude	Longitude	Site Description
1	n/a	n/a	2km upstream from mouth @ Thames River
2	n/a	n/a	S. bank and N.bank, 1km S. of Jeanette's Creek mouth
3	42.31310	-82.43850	in outfall across from LSCFAU
4	n/a	n/a	about 100m - 1000m upstream of Baptiste Creek mouth
5	n/a	n/a	500m upstream from confluence w/Thames
6	n/a	n/a	1.5km upstream from mouth @Thames R.
7	n/a	n/a	Thames river at mouth of Jeanette's Creek
8	n/a	n/a	Thames river main channel 1000m upstream of Baptiste creek mouth
9	n/a	n/a	Thames River, erosional side, 150m upstream from mouth of Jeanette's
10	42.33403	-82.40742	4km upstream from MNR docks (Lake St. Clair MU), North bank
11	42.33882	-82.40670	4km upstream from Lake St. Clair MU docks, South bank
12	42.33645	-82.39663	5 km upstream from Lake St. Clair management unit docks (Baptiste creek) - North shore sampled
13	42.33580	-82.39565	5km upstream from Lake St. Clair MU (Baptiste Creek), South shore sampled
14	42.33643	-82.39457	5 km upstream from Lake St. Clair MU docks (Baptiste creek), sampled north shore
15	n/a	n/a	5km upstream from the Lake St. Clair MU docks (Baptiste creek)
16	42.41512	-82.16813	Chatham CA off Kingsway rd. 0.5Km upstream
17	42.41848	-82.16490	Chatham CA off Kingsway. 1 Km upstream
18	42.42553	-82.18597	Chatham CA off Kingsway Rd. 1.5 Km upstream
19a+b	42.42578	-82.15523	Chatham CA off Kingsway rd. 2 Km upstream. South Bank
20a+b	42.42347	-82.14923	Chatham CA off Kingsway Rd. - 2.5km upstream of launch, north bank
21a+b	42.42830	-82.14923	Chatham CA off Kingsway Rd. - 3km upstream of launch; south bank
22a+b	42.40820	-82.16830	Thames Grove CA, off Kingsway St. (Chatham), 0.5km upstream of launch, North bank.
23a+b	42.41852	-82.16477	Thames Grove CA off Kingsway (Chatham); 1Km upstream (South bank)
24a+b	42.42207	-82.16030	Thames Grove CA off Kingsway (Chatham); 1.5 Km upstream (North Bank).
25	42.42437	-82.15520	2 Km upstream; South shore. Thames grove CA off Kingsway (Chatham)
26	42.42570	-82.14932	Thames Grove CA off Kingsway, 2.5km upstream from boat launch; north shore.
27	42.42788	-82.14827	3 km upstream boat launch @Thames Grove CA, south shore
28a+b	42.43140	-82.14835	Thames Grove CA, 3.5 km upstream of launch. North shore. Chatham
29	42.43122	-82.14865	Thames Grove CA Chatham (off Kingsway), 3.5km upstream of launch, north shore.
30a+b	42.43472	-82.14420	Thames Grove CA (Chatham) off Kingsway - 4km upstream of launch, south shore
31	42.43452	-82.14480	Thames Grove CA (Chatham) - off Kingsway. 4km upstream of launch, south bank

Appendix 2. Continued.

Site	Latitude	Longitude	Site Description
32a+b	42.44362	-82.14730	Thames Grove CA (Chatham), off Kingsway. 4.5 km upstream of boat launch, North shore.
33	42.43608	-82.13972	Thames Grove CA off Kingsway (Chatham). 4.5 km upstream of launch, north bank.
34	42.64857	-81.71990	Downstream of Boat ramp at Conservation Area
35	42.64107	-81.71545	Thames River, Big Bend; downstream of Conservation Area
36	42.63960	-81.71386	Thames River; Big Bend, downstream of Conservation area
37	42.64819	-81.72044	Thames River; Big Bend- downstream of Conservation Area
38	42.64074	-81.71529	Downstream of Big Bend Conservation area
39	42.64080	-81.70994	Thames River; Downstream of Big Bend Conservation Area
40	42.65175	-81.70422	Thames River, Big Bend: upstream of conservation area
41	42.64948	-81.69761	Thames River, Big Bend; upstream of conservation area
42	42.64452	-81.70224	Thames River, Big Bend- downstream of Conservation Area
43	42.64322	-81.70410	NA
44	42.64084	-81.70312	Thames River, Big Bend, Upstream of the Conservation area boat launch
45	42.64005	-81.70460	Upstream of Big Bend boat ramp
46	42.65150	-81.70228	Upstream of Big Bend Conservation area
47	42.64838	-81.69813	Upstream of Big Bend Conservation Area (Approximately 1.5 Km)
48	42.64600	-81.69967	Upstream of Big Bend Conservation area (approx 1km)
49	42.64431	-81.70337	Upstream of the Big Bend Conservation Area
50	42.64057	-81.70247	upstream of big bend conservation area
51	42.64089	-81.70570	Upstream of Boat Ramp at Big Bend Conservation Area

Appendix 3. Site descriptions for 2004 sites on the lower Thames River.

Site	Lat	Long	Site Description
1a+b	42.709	-81.6159	200m upstream of Coyne Rd. (Tates Bridge)
2a+b	42.6831	-81.6284	
3a+b	42.6965	-81.6514	Mouth of Newbiggen Creek
4a+b	42.6933	-81.6865	Downstream of Coyne Rd. about 11km upstream of Big Bend
5a+b	42.6731	-81.6902	500m upstream of Simpson's Bridge
6a+b	42.6689	-81.7116	Downstream of Coyne Rd. about 16km upstream of Big Bend CA
7a+b	42.6648	-81.7169	Upstream of Big Bend ~6km
8a+b	42.6613	-81.7124	Upstream of site TR07 ~ 1km
9a+b	42.6607	-81.7082	
10a+b	42.6446	-81.7026	Upstream of Big Bend approx. 2km
11a+b	42.6406	-81.7019	Upstream of Big Bend ~1km
12a+b	42.6422	-81.708	Approximately 50 m downstream of Big Bend
13a+b	42.6476	-81.7203	~1km downstream of Big Bend
14a+b	42.6503	-81.719	Downstream of Big Bend 2km
15a+b	42.6613	-81.7375	Downstream of Big Bend; upstream of site 016 by 5.36km
16a+b	42.6472	-81.7581	Downstream of Big Bend; ~2.5km upstream of site TR017
17a+b	42.639	-81.7802	9 km downstream of Big Bend CA; downstream of 1st bridge
18	42.9657	-81.3879	200m upstream of highway 14 bridge, in Kilworth
19	42.9353	-81.421	Upstream of Hwy 16 bridge; ~75m, North bank of river
20	42.9086	-81.4249	200m upstream from Highway 2 in Delaware
21	42.8725	-81.3895	150 m upstream from Westminster Rd bridge on left bank (looking up stream)
22	42.9519	-81.4008	Downstream of Kilworth Heights
23	42.938	-81.412	Upstream of Hwy 16 Bridge, approx 800m, access site by walking from bridge
24	42.9315	-81.4253	Downstream of highway 16 bridge; downstream point of large gravel/sand bar
25	42.9196	-81.4345	Downstream of Highway 16; accessed from road right of way; west of Komoka Trout Farm
26	42.9087	-81.439	Upstream of Delaware; ~500m north of Highway 81 and High Bank
27	42.8993	-81.4198	Upstream of highway 402, ~500m; access @Delaware Park off Wellington St.
28	42.87	-81.4057	Upstream of Westminster Bridge; ~8.5km downstream of Delaware
29	42.863	-81.3922	Downstream of Westminster Bridge; ~1km, floated down from bridge.
30	42.8569	-81.3967	Downstream of Westminster Bridge; ~2km; West Bank

Appendix 3. Continued.

Site	Lat	Long	Site Description
31	42.8486	-81.4032	3.5km downstream of Westminster bridge, between Westminster and Muncey
32	42.8335	-81.4208	Downstream of Westminster Bridge; ~6km; upstream of Muncey Rd., ~1.5km
33a+b	42.5444	-81.9683	50m downstream of Thamesville bridge.
34a+b	42.5548	-81.9566	
35a+b	42.54	-81.9828	
36a+b	42.5487	-81.992	Sampled at the inflow of a coldwater tributary
37a+b	42.536	-82.0049	
38a+b	42.5283	-82.0451	
39a+b	42.5148	-82.0525	
40a+b	42.5029	-82.0787	
41a+b	42.4965	-82.0781	

Appendix 4. Site descriptions for lower Thames River tributary sites in 2004.

Site	Waterbody	Latitude	Longitude	Site Description
1	Jeanette's Creek	42.328	-82.3142	On the south bank of Jeannette's Creek, upstream of the 3rd Line bridge.
2	White Ash Creek	42.5442	-81.9686	On the downstream side of Magnavilla Line Crossing, just east of Highway 21.
3	Jeanette's Creek	42.3395	-82.2256	on Sixth Line East of Dillon Rd.
4	Unnamed Creek	42.4837	-82.0987	On River Line at Maple City Golf Course
5	Unnamed Creek	42.4743	-82.0802	Mull Rd. crossing north of Northwood Line
6	Unnamed Creek	42.4957	-82.0747	On the north side of River Line, west of Kent Bridge Road
7	Julian Drain	42.5111	-82.0471	On the south side of River Line east of Kent Bridge Road
8a+b	Julian Drain	42.5179	-82.0159	On Scane Rd. between River Line and Magnavilla Line.
9	Cornwall Creek	42.5505	-81.9877	Highway 2, west of Thamesville, downstream of culvert
10	Julian Drain	42.5216	-82.0009	Magnavilla Line
11	Julian Drain	42.5434	-81.9652	On Highway 21 at intersection with Magnavilla Rd. South of Magnavilla.
12	Unnamed Creek	42.3766	-82.158	On Seventh Line E., West of Highway 10 south of Chatham
13	Unnamed Creek	42.3965	-82.1516	Indian Road, between culvert and driveway access from cemetery
14	Unnamed Creek	42.4963	-82.0501	On Highway 15, north of Northwood Line on southwest side of the road
15	Cornwall Creek	42.5684	-81.9553	2km east of Thamesville, North Pitt Road to dead-end East to 1st crossing of Cornwall Creek on Base Line
16	Unnamed Creek	42.5576	-81.9877	Highway 21 north of Thamesville; site is on the west side of the road, north of Base line
17	Unnamed Creek	42.6166	-81.8395	On the Hwy 2 between Peter Rd. and Clachan Rd.
18	Unnamed Creek	42.3655	-82.1479	Just W of Charing Cross Rd. on 8th line south of Chatham.
19	Unnamed Creek	42.5926	-81.8652	East of 18 south of the Thames River on Lawrence Line
20	Baptiste Creek	42.2328	-82.3697	130m length mediated up and downstream by Quinn L. bridge
21	Baptiste Creek	42.2768	-82.3792	Queens Line, upstream and downstream
22	Baptiste Creek	42.2812	-82.3962	Upstream and downstream 50m of bridge
23	McDougal Creek	42.48	-81.9282	McDougal Creek downstream of McLarty Line
24a+b	Macgregor Drain	42.407	-82.0582	Upstream to 200m above Harwich Rd.
25	MacGregor Drain	42.4274	-82.0233	200m upstream of Mull Rd.
26	Unknown Trib.	42.4743	-82.0808	Upstream and downstream of Mull Rd., just north of Northwood Line
27	Duck Creek	42.29266	-82.68730	Underneath Notre Dame St. bridge; near the town of Belle River
28	Duck Creek	42.27372	-82.68904	100 m up and downstream of Essex 42 bridge; near the town of Belle River

Appendix 5. Summary of effort and gear type for 2003 lower Thames River sites.

Site	Field Number	Method	Effort	Effort Units	Electrofishing Settings	Description of Method
1	THR150703001	Boat Seine	1	hauls		50 m boat seine, 9.5 mm mesh
2	THR150703002	Small-mesh Fyke Net	20	hours		Two small-mesh fyke nets, 6.35 mm mesh
3	THR150703003	Boat Electrofishing	119	seconds	1000v 30hz@40% = 6amps	SAR, E-fishing Boat (LOWE), 4.3m 5.0 kW, single boom
4	THR160703001	Trawl	5	hauls		Trawl net, small mesh; 2-5 minutes per trawl
5	THR160703002	Gill Net	81	minutes		30 m gill net, 25.4 mm mesh
6	THR160703003	Gill Net	4	hours		30 m gill net, 38 mm mesh
7	THR170703001	Small-mesh Fyke Net	19	hours		Small-mesh fyke net, 6.35 mm mesh
8	THR170703002	Trawl	3	minutes		Trawl net, small mesh - number of hauls unknown
9	THR170703003	Small-mesh Fyke Net	18.5	hours		Small-mesh fyke net, 6.35 mm mesh
10	THR230703001	Large-mesh Fyke Net, Minnow Trap, Windermere Trap	21	hours		Large-mesh fyke net, 25.4 mm mesh
11	THR230703002	Large-mesh Fyke Net, Minnow Trap, Windermere Trap	21	hours		Combination large-mesh fyke net, 25.4 mm mesh, Windermere trap and minnow trap
12	THR240703001	Large-mesh Fyke Net, Minnow Trap, Windermere Trap	25.25	hours		Combination large-mesh fyke net, 25.4 mm, minnow trap & Windermere trap
13	THR240703002	Large-mesh Fyke Net, Minnow Trap	23.5	hours		Combination large-mesh fyke net, 25.4 mm mesh, minnow trap, Windermere trap
14	THR240703003	Small-mesh Fyke Net	23.5	hours		Small-mesh fyke net, 6.35 mm mesh
15	THR240703004	Trawl	0	hauls		Trawl net was snagged and data not collected
16	THR290703001	Boat Seine	10	minutes		Boat seine, 50 m, 6.35 mm mesh
17	THR290703002	Boat Seine	20	minutes		Boat seine, 50 m, 6.35 mm mesh
18	THR290703003	Boat Seine	1	hauls		Boat seine, 50 m, 6.35 mm mesh
19a	THR290703004	Small-mesh Fyke Net	21.75	hours		Small-mesh fyke net, 6.35 mm mesh
19b	THR030903004	Boat Electrofishing	278	seconds	1000V, 30 Hz@ 55% = 6 Amps	SAR, Efishing Boat (LOWE), 4.3 m, 5.0 kW, single boom
20a	THR290703005	Large-mesh Fyke Net, Minnow Trap	21.75	hours		Combination large-mesh fyke net, 25.4 mm mesh and minnow trap
20b	THR030903005	Boat Electrofishing	320	seconds	1000v 30hz @55% = 6amps	SAR, Efishing Boat (LOWE), 4.3 m, 5.0 kW, single boom
21a	THR290703006	Large-mesh Fyke Net, Minnow Trap	22	hours		Large-mesh fyke net, 25.4 mm mesh, minnow trap
21b	THR030903006	Boat Electrofishing	284	seconds	1000v 30Hz @ 55% = 6 amps	SAR, Efishing Boat (LOWE), 4.3 m, 5.0 kW, single boom
22a	THR300703001	Large-mesh Fyke Net, Minnow Trap	22.5	hours		Combination large-mesh fyke net, 25.4 mm mesh, minnow trap
22b	THR030903001	Boat Electrofishing	292	seconds	1000V, 30Hz @ 55% = 6Amps	SAR, Efishing Boat (LOWE), 4.3 m, 5.0 kW, single boom
23a	THR300703002	Small-mesh Fyke Net	22	hours		Small-mesh fyke net, 6.35 mm mesh
23b	THR030903002	Boat Electrofishing	258	seconds	1000V, 30Hz @55% = 6 Amps	SAR, Efishing Boat (LOWE), 4.3 m, 5.0 kW, single boom
24a	THR300703003	Large-mesh Fyke Net, Minnow Trap	21.45	hours		Combination large-mesh fyke net, 25.4 mm mesh, minnow trap
24b	THR030903003	Boat Electrofishing	300	seconds	1000V, 30 Hz @ 55% = 6 Amps	SAR, Efishing Boat (LOWE), 4.3 m, 5.0 kW, single boom
25	THR300703004	Boat Seine	1	hauls		Boat seine, 50 m, 6.35 mm mesh
26	THR300703005	Boat Seine	1	hauls		Boat seine, 50 m, 6.35 mm mesh

Appendix 5. Continued.

Site	Field Number	Method	Effort	Effort Units	Electrofishing Settings	Description of Method
27	THR300703006	Boat Seine	1	hauls		Boat seine, 50 m, 6.35 mm mesh
28a	THR310703001	Large-mesh Fyke Net	20	hours		Large-mesh fyke net, 25.4 mm mesh
28b	THR030903007	Boat Electrofishing	350	seconds	1000v - 30hz@ 55% = 6 amps	SAR, Efishing Boat (LOWE), 4.3 m, 5.0 kW, single boom
29	THR310703002	Boat Seine	1	haul		Boat seine, 50 m, 6.35 mm mesh
30a	THR310703003	Small-mesh Fyke Net	19.75			Small-mesh fyke net, 6.35 mm mesh
30b	THR030903008	Boat Electrofishing	301	seconds	1000v 30hz @55% = 6 amps	SAR, E-fishing Boat (LOWE), 4.3 m 5.0 kW, single boom
31	THR310703004	Boat Seine	1	haul		Boat seine, 50 m, 6.35 mm mesh
32a	THR310703005	Large-mesh Fyke Net, Minnow Trap	19.75	Hours		Large-mesh fyke net, 25.4 mm mesh
32b	THR030903009	Boat Electrofishing	345	seconds	1000v 30hz@55% = 6amps	SAR, E-fishing Boat (LOWE), 4.3 m, 5.0 kW, single boom
33	THR310703006	Boat Seine	1	Haul		Boat seine, 50 m, 6.35 mm mesh
34	BB230903BEF-001	Boat Electrofishing	10	minutes	1000V, 30 Hz, 5A	SAR, E-fishing Boat (LOWE), 4.3 m, 5.0 kW, single boom
35	BB230903BEF-002	Boat Electrofishing	11	minutes	1000V, 6amps, 30Hz	SAR, E-fishing Boat (LOWE), 4.3 m, 5.0 kW, single boom
36	BB230903BEF-003	Boat Electrofishing	12	minutes	1000V, 30Hz, 6A	SAR, E-fishing Boat (LOWE), 4.3 m, 5.0 kW, single boom
37	BB230903SN-001	Straight Seine	5	haul	n/a	Straight seine, 10 m, 6.35 mm mesh
38	BB230903SN-002	Bag Seine	5	haul	n/a	Bag seine, 10 m, 6.35 mm mesh
39	BB230903SN-03	Straight Seine	5	haul		Straight seine, 10 m, 6.35 mm mesh
40	BB240903BEF-001	Boat Electrofishing	10	minutes	1000V, 6 amps, 30Hz	SAR, E-fishing Boat (LOWE), 4.3 m, 5.0 kW, single boom
41	BB240903BEF-002	Boat Electrofishing			1000V, 6A, 30Hz	SAR, E-fishing Boat (LOWE), 4.3 m, 5.0 kW, single boom
42	BB240903BEF-003	Boat Electrofishing	12	minutes	1000V, 30 Hz, 6A	SAR, E-fishing Boat (LOWE), 4.3 m, 5.0 kW, single boom
43	BB240903BEF-004	Boat Electrofishing	9	minutes	1000V, 6A, 30 Hz	SAR, E-fishing Boat (LOWE), 4.3 m, 5.0 kW, single boom
44	BB240903BEF-005	Boat Electrofishing	13	minutes	1000V, 6 amps, 30Hz	SAR, E-fishing Boat (LOWE), 4.3 m, 5.0 kW, single boom
45	BB240903BEF-006	Boat Electrofishing	16	minutes	1000V, 6A, 30Hz	SAR, E-fishing Boat (LOWE), 4.3 m, 5.0 kW, single boom
46	BB240903SN-001	Bag Seine	5	haul		Bag seine, 10 m, 6.35 mm mesh
47	BB240903SN-002	Straight Seine	5	haul		Straight seine, 10 m, 6.35 mm mesh
48	BB240903SN-003	Bag Seine	5	haul		Bag seine, 10 m, 6.35 mm mesh
49	BB240903SN-004	Straight Seine	5	haul		Straight seine, 10 m, 6.35 mm mesh
50	BB240903SN-005	Straight Seine	5	haul		Straight seine, 10 m, 6.35 mm mesh
51	BB240903SN-006	Straight Seine	5	haul		Straight seine, 10 m, 6.35 mm mesh

Appendix 6. Effort expended and species caught at bag seine sites in the lower Thames River, 2003.

Species	% Composition	Total	38	46	48
blackside darter	**0.65**	**3**	2	1	
bluntnose minnow	**15.47**	**71**	14	49	8
channel catfish	**3.49**	**16**	12	2	2
creek chub	**0.65**	**3**		3	
emerald shiner	**33.99**	**156**	70	62	24
ghost shiner	**14.16**	**65**	12	28	25
gizzard shad	**14.38**	**66**	21	35	10
golden redhorse	**2.83**	**13**	3	7	3
johnny darter	**1.31**	**6**	2	2	2
rock bass	**0.65**	**3**		1	2
shorthead redhorse	**0.43**	**2**		1	1
spotfin shiner	**8.93**	**41**	7	15	19
stonecat	**0.87**	**4**	1	1	2
troutperch	**1.52**	**7**		3	4
white perch	**0.22**	**1**			1
white sucker	**0.22**	**1**		1	
yellow perch	**0.22**	**1**		1	
Total	**100**	**459**	**144**	**212**	**103**
Effort (# of hauls)			**5**	**5**	**5**
CPUE (fish/haul)			**28.8**	**42.4**	**20.6**
Average CPUE (fish/haul)			30.6		

Appendix 7. Effort expended and species caught at straight seine sites in the lower Thames River, 2003.

Species	% Composition	Total	37	39	47	49	50	51
blackside darter	**0.09**	**2**						2
bluntnose minnow	**18.61**	**405**	12	2	22	58	297	14
brindled madtom	**0.05**	**1**						1
central stoneroller	**0.69**	**15**	1				14	
channel catfish	**1.42**	**31**	3	3	2		18	5
common carp	**0.05**	**1**				1		
common shiner	**0.05**	**1**		1				
creek chub	**0.05**	**1**					1	
eastern sand darter	**0.14**	**3**		1			2	
emerald shiner	**26.30**	**572**	171	12	129	46	176	38
ghost shiner	**22.20**	**483**	17	2	41	105	265	53
gizzard shad	**7.77**	**169**	18	4	44	19	73	11
golden redhorse	**3.18**	**69**		3	3	6	46	11
greenside darter	**0.09**	**2**			1			1
johnny darter	**1.88**	**41**				4	36	1
logperch	**0.18**	**4**				4		
mimic shiner	**2.39**	**52**			1		51	
minnow sp.	**0.14**	**3**			3			
mooneye	**0.09**	**2**	2					
northern hog sucker	**0.28**	**6**					4	2
quillback	**0.37**	**8**					8	
rock bass	**0.28**	**6**	1	1		2		2
shorthead redhorse	**0.55**	**12**			1	1	6	4
silver redhorse	**0.09**	**2**		1			1	
smallmouth bass	**0.05**	**1**			1			
spotfin shiner	**11.72**	**255**	3	6	15	15	179	37
stonecat	**0.46**	**10**		2	3	1		4
troutperch	**0.60**	**13**				9		4
white perch	**0.18**	**4**	2			1	1	
white sucker	**0.05**	**1**					1	
yellow perch	**0.05**	**1**				1		
Total	**100**	**2176**	**230**	**38**	**266**	**273**	**1179**	**190**
Effort (# of hauls)			**5**	**5**	**5**	**5**	**5**	**5**
CPUE (fish/haul)			**46**	**7.6**	**53.2**	**54.6**	**235.8**	**38**
Average CPUE (fish/haul)			72.53					

Appendix 8. Effort expended and species caught at gill net sites on the lower Thames River, 2003.

Species	% Composition	Total	5	6
buffalo sp.	2.56	2	1	1
channel catfish	37.18	29	6	23
freshwater drum	7.69	6	3	3
goldfish X common carp hybrid	1.28	1		1
longnose gar	1.28	1		1
northern pike	1.28	1		1
shorthead redhorse	8.97	7		7
white bass	14.10	11	7	4
white crappie	3.84	3	1	2
white perch	20.51	16	5	11
yellow perch	1.28	1		1
Total	100	78	23	55
Effort (hours)			1.35	4
CPUE (fish/hour)			17.04	13.75
Average CPUE (fish/hour)			15.40	

Appendix 9. Effort expended and species caught at a large-mesh fyke net site on the lower Thames River, 2003.

Species	% Composition	Total	28a
brown bullhead	25.00	1	1
freshwater drum	75.00	3	3
Total	100	4	4
Effort (hours)			20
CPUE (fish/hour)			0.2

Appendix 10. Effort expended and species caught at large-mesh fyke net/minnow trap/Windemere trap sites on the lower Thames River, 2003.

Species	% Composition	Total	10	11	12
bluegill	5.88	1			1
brown bullhead	5.88	1		1	
buffalo sp.	5.88	1	1		
channel catfish	11.76	2		1	1
freshwater drum	5.88	1		1	
rock bass	5.88	1		1	
spottail shiner	52.94	9			9
white crappie	5.88	1			1
Total	100	17	1	4	12
Effort (hours)			21	21	25.25
CPUE (fish/hour)			0.048	0.19	0.48
Average CPUE (fish/hour)				0.24	

Appendix 11. Effort expended and species caught at large-mesh fyke net/minnow trap sites on the lower Thames River, 2003.

Species	% Composition	Total	13	20a	21a	22a	24a	32a
black crappie	4.54	1	1					
brindled madtom	9.10	2				2		
channel catfish	9.10	2				1		1
common carp	13.64	3					2	1
freshwater drum	13.64	3		1	1			1
rock bass	4.54	1			1			
round goby	4.54	1		1				
shorthead redhorse	4.54	1	1					
smallmouth bass	4.54	1		1				
spotted sucker	9.10	2			2			
white bass	4.54	1		1				
white crappie	13.64	3	3					
white perch	4.54	1	1					
Total	100	22	6	4	4	3	2	3
Effort (hours)			23.5	21.75	22	22.5	21.45	19.75
CPUE (fish/hour)			0.25	0.18	0.18	0.13	0.09	0.15
Average CPUE (fish/hour)			0.16					

Appendix 12. Effort expended and species caught at small-mesh fyke net sites on the lower Thames River, 2003.

Species	Total	2	7	9	14	19a	23a	30a
black crappie	**2**		1		1			
bluegill	**7**	7						
brown bullhead	**1**	1						
channel catfish	**8**		2		1	2	1	2
common carp	**5**		1		1	1	1	1
emerald shiner	**1**	1						
freshwater drum	**5**	1				1	2	1
gizzard shad	**> 271**			> 200	60	2		9
largemouth bass	**3**	1	1		1			
longnose gar	**1**							1
northern pike	**1**			1				
pumpkinseed	**1**		1					
rock bass	**5**	2					1	2
shorthead redhorse	**7**	2				3		2
spotfin shiner	**4**		3	1				
spotted sucker	**2**					1		1
white bass	**3**			1				2
white crappie	**15**	7	3		1	3		1
white perch	**2**						1	1
yellow bullhead	**1**					1		
yellow perch	**2**			1		1		
Total	**> 347**	**22**	**12**	**204+**	**65**	**15**	**6**	**23**
Effort (hours)		**20**	**19**	**18.5**	**23.5**	**21.75**	**22**	**19.75**
CPUE (fish/hour)		**1.1**	**0.63**	**n/a**	**2.76**	**0.69**	**0.27**	**1.16**
Average CPUE (fish/hour)*		**1.10**						

*excluding Site 9

Appendix 13. Effort expended and species caught at boat electrofishing sites on the lower Thames River, 2003.

Species	Total	3	19b	20b	21b	22b	23b	24b	28b	30b	32b	34	35	36	40	41	42	43	44	45
black crappie	1			1																
black redhorse	5											1	2				2			
blackside darter	1														1					
bluegill	14	14																		
bluntnose minnow	146												2		40	8	9	21	66	
brook silverside	1		1																	
channel catfish	18	2		1								1	2		2	4	1		4	1
common carp	30	3	2	4		5	1	4	2		1		1			1	1	1	1	3
eastern sand darter	9																2	2	3	2
emerald shiner	431				2						8	8	27	1	55	61	58	92	90	29
freshwater drum	16	2	2		2			2	1	3		1				1	1			1
ghost shiner	138										3				3	14	22	38	52	6
gizzard shad	>2490		300+	150+	300+	150+	500+	300+	300+	300+	100+	4	11	9	7	5	5	8	35	6
golden redhorse	46		1								1	5	5	10	5	9	3	1	4	2
greater redhorse	2																	2		
greenside darter	1																			1
johnny darter	6														1		3	2		
largemouth bass	7	2	1		2		1		1											
logperch	7											1					1	2		3
mimic shiner	11														7				4	
mooneye	7											1		2				3		1
northern hog sucker	41											2	4	2	2	4	8		13	6
northern madtom	1																1			
pumpkinseed	3	2					1													
quillback	5																	1	4	
river redhorse	2															1		1		
rock bass	4															1	1			1
shorthead redhorse	77		1	1	1	1		1	1			5	4	10	6	12	7		10	17
silver redhorse	34		1	1				1	1			4	3	7	2	3	6		2	3
smallmouth bass	9		1		1	1		1									3			2
spotfin shiner	70														15	13	8	5	29	
spotted sucker	2			1									1							
stonecat	2																1			1
troutperch	11												2		2	1		2	4	
white bass	34	5		10	1	5	2	1	2	1		1				2		1		2
white crappie	1			1																
white perch	11											4	2	1		1			2	1
white sucker	1																		1	
yellow bullhead	2	2																		
Total	>3697	32	>311	>170	>309	>162	>505	>310	>308	>304	>113	39	66	42	148	141	143	182	324	88
Effort (hours)		0.033	0.077	0.089	0.079	0.081	0.072	0.083	0.097	0.084	0.096	0.167	0.183	0.2	0.167	n/a	0.2	0.15	0.217	0.267
CPUE (fish/hour)		969.6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	233.5	360.5	210	886.2	n/a	715	1213.3	1493.1	329.6
Average CPUE (fish/hour)		712.3*																		

*excluding sites 19b, 20b, 21b, 22b, 23b, 24b, 28b, 30b, 32b, 41

Appendix 14. Effort expended and species caught at boat seine sites on the lower Thames River, 2003.

Species	Total	1	16	17	18	25	26	27	29	31	33
bluntnose minnow	**31**					1		1	3	22	4
brindled madtom	**1**										1
brown bullhead	**3**	1				1				1	
channel catfish	**159**	2	2	5	14	25	4	5	24	42	36
common carp	**2**			2							
emerald shiner	**232**		35	81	17	10	20	20	10	11	28
freshwater drum	**>100**	>100									
ghost shiner	**259**		8	6	10	50	21	10	27	41	86
gizzard shad	**>1776**	>1000	4	2	>300		>150	>200	81	3	36
golden redhorse	**15**					3	1		2	7	2
johnny darter	**10**				1				2	3	4
largemouth bass	**4**					1		1	1	1	
logperch	**30**			4		7	1	7	5	3	3
longnose gar	**2**	2									
mooneye	**15**		7	2			4				2
pumpkinseed	**1**									1	
quillback	**9**									5	4
redhorse sp.	**28**					12	1	5		10	
rock bass	**6**					2		2		2	
round goby	**9**	2				3				1	3
shorthead redhorse	**1**					1					
silver redhorse	**1**										1
smallmouth bass	**2**	1				1					
spotfin shiner	**14**					2		5	6	1	
spottail shiner	**29**		5	1	4	5		2	3	2	7
troutperch	**2**								1		1
white bass	**>111**	>100	1				1	4			5
white crappie	**7**	4		1						1	1
white perch	**12**	1		1					8	2	
white sucker	**54**			1	2	2			6	21	22
yellow perch	**>151**	>100	1	14	2	5	1	8	3	9	8
Total	**>3076**	**>1313**	**63**	**120**	**>350**	**131**	**>204**	**>270**	**182**	**189**	**254**
Effort (hauls)		1	1	1	1	1	1	1	1	1	1
CPUE (fish/haul)		n/a	63	120	n/a	131	n/a	n/a	182	189	254
Average CPUE (fish/haul)		156.5*									

*excluding sites 1, 18, 26, 27

Appendix 15. Effort expended and species caught at trawl sites on the lower Thames River, 2003.

Species	% Composition	Total	4	8	15*
brook silverside	**0.09**	**1**	1		
brown bullhead	**17.70**	**200**	200		
channel catfish	**13.53**	**153**	147	6	
common carp	**0.09**	**1**	1		
freshwater drum	**19.87**	**224**	199	25	
ghost shiner	**4.69**	**53**	3	50	
gizzard shad	**19.87**	**224**	202	22	
minnow sp.	**3.18**	**36**	36		
mooneye	**3.09**	**35**	6	29	
round goby	**0.17**	**2**	1	1	
spottail shiner	**0.79**	**9**		9	
troutperch	**0.26**	**3**	3		
walleye	**0.09**	**1**		1	
white bass	**0.09**	**1**		1	
white crappie	**0.26**	**3**		3	
yellow perch	**16.36**	**185**	185		
Total	**100**	**1131**	**984**	**147**	**0**
Effort (hauls)			**5**	**n/a**	**-**
CPUE (fish/haul)			**196.8**	**n/a**	**-**
Average CPUE (fish/haul)			**n/a**		

*trawl net snagged, no fishes collected

Appendix 16. Effort and gear type at sites on the lower Thames River, 2004.

Sample Period 1 – July 2004						
Site	**Date**	**Capture Method**	**Duration**	**Effort Units**	**Electrofishing Settings**	**Description of Method**
1a	14/07/04	Straight Seine Net	5	hauls		Straight seine, 10m, 6.35 mm mesh
1b	14/07/04	Boat Electrofishing	649	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
2a	14/07/04	Straight Seine Net	5	hauls		Straight seine, 10m, 6.35 mm mesh
2b	14/07/04	Boat Electrofishing	659	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
3a	14/07/04	Straight Seine Net	5	hauls		Straight seine, 10m, 6.35 mm mesh
3b	14/07/04	Boat Electrofishing	n/a	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
4a	14/07/04	Straight Seine Net	n/a	hauls	-	Straight seine, 10m, 6.35 mm mesh
4b	14/07/04	Boat Electrofishing	n/a	seconds	n/a	E-fishing boat, 4.3 m, 5.0 kW, single boom
5a	15/07/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
5b	15/07/04	Boat Electrofishing	612	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
6a	15/07/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
6b	15/07/04	Boat Electrofishing	552	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
7a	15/07/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
7b	15/07/04	Boat Electrofishing	596	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
8a	15/07/04	Straight Seine Net	n/a	hauls	-	Straight seine, 10m, 6.35 mm mesh
8b	15/07/04	Boat Electrofishing	n/a	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
9a	15/07/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
9b	15/07/04	Boat Electrofishing	651	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
10a	15/07/04	Straight Seine Net	n/a	hauls	-	Straight seine, 10m, 6.35 mm mesh
10b	15/07/04	Boat Electrofishing	n/a	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
11a	15/07/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
12a	20/07/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
12b	20/07/04	Boat Electrofishing	1123	seconds	n/a	E-fishing boat, 4.3 m, 5.0 kW, single boom
13a	20/07/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
13b	20/07/04	Boat Electrofishing	n/a	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
14a	20/07/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
14b	20/07/04	Boat Electrofishing	n/a	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
15a	20/07/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
15b	20/07/04	Boat Electrofishing	612	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
16a	21/07/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
16b	21/07/04	Boat Electrofishing	605	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
17a	21/07/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
17b	21/07/04	Boat Electrofishing	555	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
18	28/07/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
19	28/07/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh

Appendix 16. Continued.

Sample Period 1 – July 2004

Site	Date	Capture Method	Duration	Effort Units	Electrofishing Settings	Description of Method
20	28/07/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
21	29/07/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
22	04/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
23	04/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
24	04/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
25	04/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
26	04/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
27	04/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
28	04/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
29	04/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
30	05/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
31	05/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
32	05/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh

Sample Period 2 – August 2004

Site	Date	Capture Method	Duration	Effort Units	Electrofishing Settings	Description of Method
1a	17/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
1b	17/08/04	Boat Electrofishing	525	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
2a	17/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
2b	17/08/04	Boat Electrofishing	607	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
3a	17/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
3b	17/08/04	Boat Electrofishing	n/a	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
4a	17/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
4b	17/08/04	Boat Electrofishing	602	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
5a	19/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
5b	19/08/04	Boat Electrofishing	622	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
6a	19/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
6b	19/08/04	Boat Electrofishing	627	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
7a	19/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
7b	19/08/04	Boat Electrofishing	648	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
8a	19/08/04	Straight Seine Net	5	hauls		Straight seine, 10m, 6.35 mm mesh
8b	19/08/04	Boat Electrofishing	585	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
9a	18/08/04	Straight Seine Net	5	hauls		Straight seine, 10m, 6.35 mm mesh
9b	18/08/04	Boat Electrofishing	614	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
10a	18/08/04	Straight Seine Net	5	hauls		Straight seine, 10m, 6.35 mm mesh
10b	18/08/04	Boat Electrofishing	587	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom

Appendix 16. Continued.

Sample Period 2 – August 2004						
Site	**Date**	**Capture Method**	**Duration**	**Effort Units**	**Electrofishing Settings**	**Description of Method**
11a	18/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
11b	18/08/04	Boat Electrofishing	647	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
12a	24/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
12b	24/08/04	Boat Electrofishing	659	seconds	n/a	E-fishing boat, 4.3 m, 5.0 kW, single boom
13a	24/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
13b	24/08/04	Boat Electrofishing	n/a	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
14a	24/08/04	Straight Seine Net	n/a	hauls	-	Straight seine, 10m, 6.35 mm mesh
14b	24/08/04	Boat Electrofishing	n/a	seconds	n/a	E-fishing boat, 4.3 m, 5.0 kW, single boom
15a	24/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
15b	24/08/04	Boat Electrofishing	612	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
16a	24/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
16b	24/08/04	Boat Electrofishing	552	seconds	n/a	E-fishing boat, 4.3 m, 5.0 kW, single boom
17a	24/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
17b	24/08/04	Boat Electrofishing	596	seconds	6 amps, 1000V, 30 Hz @ 60%, 3600 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
18	27/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
19	27/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
20	27/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
21	27/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
22	27/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
23	27/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
24	28/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
25	28/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
26	28/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
27	28/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
28	28/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
29	28/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
30	28/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
31	28/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
32	28/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
33a	25/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
33b	25/08/04	Boat Electrofishing	600	seconds	n/a	E-fishing boat, 4.3 m, 5.0 kW, single boom
34a	26/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
34b	25/08/04	Boat Electrofishing	552	seconds	6 amps, 1000V, 30 Hz @ 60%, 2750 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
35a	26/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
35b	26/08/04	Boat Electrofishing	601	seconds	n/a	E-fishing boat, 4.3 m, 5.0 kW, single boom

Appendix 16. Continued.

Sample Period 2 – August 2004						
Site	**Date**	**Capture Method**	**Duration**	**Effort Units**	**Electrofishing Settings**	**Description of Method**
36a	26/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
36b	26/08/04	Boat Electrofishing	640	seconds	n/a	E-fishing boat, 4.3 m, 5.0 kW, single boom
37a	26/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
37b	26/08/04	Boat Electrofishing	642	seconds	n/a	E-fishing boat, 4.3 m, 5.0 kW, single boom
38a	26/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
38b	26/08/04	Boat Electrofishing	602	seconds	6 amps, 1000V, 30 Hz @ 60%, 3500 Watts	E-fishing boat, 4.3 m, 5.0 kW, single boom
39a	26/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
39b	26/08/04	Boat Electrofishing	615	seconds	n/a	E-fishing boat, 4.3 m, 5.0 kW, single boom
40a	26/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
40b	26/08/04	Boat Electrofishing	611	seconds	n/a	E-fishing boat, 4.3 m, 5.0 kW, single boom
41a	26/08/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
41b	26/08/04	Boat Electrofishing	550	seconds	n/a	E-fishing boat, 4.3 m, 5.0 kW, single boom
Sample Period 3 – September 2004						
Site	**Date**	**Capture Method**	**Duration**	**Effort Units**	**Electrofishing Settings**	**Description of Method**
1	21/09/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
3	21/09/04	Straight Seine Net	3	hauls	-	Straight seine, 10m, 6.35 mm mesh
4	21/09/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
5	21/09/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
6	21/09/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
7	22/09/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
8	22/09/04	Bag Seine Net	5	hauls	-	Bag seine, 10 m, 6.35 mm mesh
9	22/09/04	Bag Seine Net	5	hauls	-	Bag seine, 10 m, 6.35 mm mesh
10	22/09/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
11	22/09/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
12	23/09/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
13	23/09/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
14	23/09/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
15	22/09/03	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
16	23/09/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
17	23/09/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
18	28/09/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
19	28/09/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
20	29/09/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
21	29/09/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh

Appendix 16. Continued.

Sample Period 3 – September 2004						
Site	**Date**	**Capture Method**	**Duration**	**Effort Units**	**Electrofishing Settings**	**Description of Method**
22	28/09/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
23	28/09/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
24	28/09/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
25	29/09/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
26	29/09/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
27	05/10/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
28	05/10/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
29	06/10/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
30	06/10/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
31	06/10/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh
32	06/10/04	Straight Seine Net	5	hauls	-	Straight seine, 10m, 6.35 mm mesh

Appendix 17. Effort and gear type used at lower Thames River tributary sites, 2004.

Site	Date	Capture Method	Duration	Effort Units	Electrofishing Settings	Description of Method
1	19/08/04	Bag Seine Net	2	hauls	-	Bag seine, 10 m, 6.35 mm mesh
2	20/08/04	Backpack Electrofishing	4924	seconds	n/a	Smith Root LR 24 backpack unit
3	24/08/04	Bag Seine Net	2	hauls	-	Bag seine, 10 m, 6.35 mm mesh
4	24/08/04	Backpack Electrofishing	927	seconds	0.75 amps, 150V, 100%	Smith Root LR 24 backpack unit
5	24/08/04	Backpack Electrofishing	843	seconds	0.75 amps, 175V	Smith Root LR 24 backpack unit
6	25/08/04	Backpack Electrofishing	1492	seconds	0.75 amps, 172V	Smith Root LR 24 backpack unit
7	25/08/04	Backpack Electrofishing	292	seconds	0.79 amps, 172V	Smith Root LR 24 backpack unit
8a	25/08/04	Mini Seine Net	1	hauls	-	Mini seine, 1.5 m, 6.35 mm mesh
8b	25/08/04	Backpack Electrofishing	460	seconds	n/a	Smith Root LR 24 backpack unit
9	26/08/04	Backpack Electrofishing	1256	seconds	0.75 amps, 170V	Smith Root LR 24 backpack unit
10	26/08/04	Backpack Electrofishing	597	seconds	n/a	Smith Root LR 24 backpack unit
11	26/08/04	Backpack Electrofishing	1642	seconds	0.75 amps, 171V, 87%	Smith Root LR 24 backpack unit
12	30/08/04	Backpack Electrofishing	974	seconds	0.85 amps, 175V, 84%	Smith Root LR 24 backpack unit
13	30/08/04	Straight Seine Net	2	hauls	-	Straight seine, 10 m, 6.35 mm mesh
14	31/08/04	Backpack Electrofishing	998	seconds	0.75 amps, 171V, 103%	Smith Root LR 24 backpack unit
15	31/08/04	Backpack Electrofishing	533	seconds	0.61 amps, 133V, 132%	Smith Root LR 24 backpack unit
16	31/08/04	Backpack Electrofishing	864	seconds	n/a	Smith Root LR 24 backpack unit
17	31/08/04	Backpack Electrofishing	820	seconds	0.49 amps, 173V	Smith Root LR 24 backpack unit
18	01/09/04	Backpack Electrofishing	908	seconds	0.8 amps, 171V, 95%	Smith Root LR 24 backpack unit
19	01/09/04	Backpack Electrofishing	615	seconds	0.35 amps, 125V	Smith Root LR 24 backpack unit
20	01/06/04	Backpack Electrofishing	802	seconds	100V, 40 Hz	Smith Root LR 24 backpack unit
21	01/06/04	Backpack Electrofishing	1203	seconds	n/a	Smith Root LR 24 backpack unit
22	01/06/04	Bag Seine Net	4	hauls	-	Bag seine, 10 m, 6.35 mm mesh
23	02/06/04	Backpack Electrofishing	1741	Seconds	100V, 60 Hz	Smith Root LR 24 backpack unit
24a	02/06/04	Bag Seine Net	5	hauls	-	Bag seine, 10 m, 6.35 mm mesh
24b	02/06/04	Backpack Electrofishing	395	seconds	150V, 60 Hz	Smith Root LR 24 backpack unit
25	02/06/04	Backpack Electrofishing	346	seconds	150V, 60 Hz	Smith Root LR 24 backpack unit
26	02/06/04	Bag Seine Net	3	hauls	-	Bag seine, 10 m, 6.35 mm mesh
27	03/06/04	Bag Seine Net	2	hauls	-	Bag seine, 10 m, 6.35 mm mesh
28	03/06/04	Backpack Electrofishing	416	seconds	n/a	Smith Root LR 24 backpack unit

Appendix 18. Effort expended and species caught at seine sites on the lower Thames River, July 2004

Species	Total	1a	2a	3a	4a	5a	6a	7a	8a	9a	10a	11a	12a	13a	14a	15a	16a	17a	18
black crappie	>1																	>1	
blacknose dace	1																		
blackside darter	>3					>1							1						
bluntnose minnow	>367	32	3		>1	>1	>1	>1	>1	>1	>1	>1	40	>1	>1		13	>1	
brook stickleback	>1					>1													
central stoneroller	>19															>1			
channel catfish	>3														>1		1	>1	
common shiner	6																		
creek chub	4																		
eastern sand darter	86	8	4			6	1			2	7	3		5	10	11	5		
emerald shiner	>260	55	52	22	>1	>1	>1	>1	>1	>1	>1	76	22	>1	>1	>1	11	>1	
fathead minnow	>8												2				3	>1	
golden redhorse	>3														>1				
green sunfish	>4										>1					>1		>1	
greenside darter	34				3		2	1									6		
johnny darter	>99			3		>1	>1	3	>1	>1	>1	>1	34	>1	>1		2	>1	
logperch	>5	2									>1							>1	
longnose dace	>1						>1												
longnose gar	1																		
mimic shiner	>154					>1							39		>1	>1		>1	1
minnow sp.	3						3												
northern hog sucker	>79	11	6	1			>1			>1	>1			>1	>1	>1	3		
pumpkinseed	4																		
quillback	>23														>1				
rainbow darter	>2				>1												1		
redhorse sp.	47	4																	
rock bass	>6							1	>1										
rosyface shiner	20																		
silver redhorse	>29		1			>1	>1	1									1		
smallmouth bass	>36								>1										6
spotfin shiner	>711	22	11	12	>1			>1	>1	>1		>1	13	>1	>1	>1	4		50
stonecat	>5				>1			2			>1			>1					
striped shiner	16																		1
troutperch	>11											>1	9					>1	
white crappie	>1																	>1	
white perch	>1								>1										
white sucker	>85					>1	>1			>1	>1	>1	13	>1	>1	>1	5	>1	
yellow perch	>2					>1													
Total		**134**	**77**	**38**	**>8**	**>15**	**>13**	**>11**	**>7**	**>8**	**>15**	**>84**	**173**	**>12**	**>20**	**>18**	**55**	**>12**	**58**
Effort (hauls)		**5**	**5**	**5**	**n/a**	**5**	**5**	**5**	**n/a**	**5**	**n/a**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**
CPUE (fish/haul)		**26.8**	**15.4**	**7.6**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**34.6**	**n/a**	**n/a**	**n/a**	**11**	**n/a**	**11.6**
Average CPUE (fish/haul) all sites*		**19.18**																	

*excluding sites 4-11, 13-15, 17

Appendix 18. Continued.

Species	Total	19	20	21	22	23	24	25	26	27	28	29	30	31	32
black crappie	>1														
blacknose dace	1													1	
blackside darter	>3										1				
bluntnose minnow	>367	48	61	4	2	4		52		14	14	35	3	19	12
brook stickleback	>1														
central stoneroller	>19		11					1	1	1	1			1	2
channel catfish	>3														
common shiner	6					6									
creek chub	4										1			1	2
eastern sand darter	86	7	3	3		1			7		1		2		
emerald shiner	>260	2	1										4	3	1
fathead minnow	>8		1							1					
golden redhorse	>3	1	1												
green sunfish	>4		1												
greenside darter	34	11	8					3							
johnny darter	>99	19	16	1		2	3		4		3				
logperch	>5								1						
longnose dace	>1														
longnose gar	1												1		
mimic shiner	>154	70	7	4		1	1	22		4			1		
minnow sp.	3														
northern hog sucker	>79	3	35	1		2	1	1	2		3		4		
pumpkinseed	4	3						1							
quillback	>23	14				1		2	4						1
rainbow darter	>2														
redhorse sp.	47	39		3										1	
rock bass	>6	2	2												
rosyface shiner	20	12	8												
silver redhorse	>29	6		1		17									
smallmouth bass	>36	8	6		1	5	2	1	3			3			
spotfin shiner	>711	160	91	31	7	2	6	91	64	32	26	13	47	5	16
stonecat	>5														
striped shiner	16	7	8												
troutperch	>11														
white crappie	>1														
white perch	>1														
white sucker	>85	8	16	2	1	1		2	2			9		16	1
yellow perch	>2			1											
Total	**>2141**	**420**	**276**	**51**	**11**	**42**	**13**	**176**	**88**	**52**	**50**	**60**	**62**	**47**	**35**
Effort (haul)		**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**
CPUE (fish/haul)		**84**	**55.2**	**10.2**	**2.2**	**8.4**	**2.6**	**35.2**	**17.6**	**10.4**	**10**	**12**	**12.4**	**9.4**	**7**
Average CPUE (fish/haul) all sites*		**19.18**													

*excluding sites 4-11, 13-15, 17

Appendix 19. Effort expended and species caught at seine sites on the lower Thames River, August 2004.

Species	Total	1a	2a	3a	4a	5a	6a	7a	8a	9a	10a	11a	12a	13a	14a	15a	16a	17a	18	19	20	21	22
blackside darter	**1**																						
bluntnose minnow	**>480**	22	14		21	17	19		>1	13	9	28	13		25	>1	39	>1		5	116	5	10
brindled madtom	**2**																						
brook stickleback	**1**																						
central stoneroller	**>60**	11	2				21	>1	>1					5	6					1	6		
channel catfish	**>68**		1				11	>1		3		4		22	12	>1	9	>1					
common carp	**1**					1																	
common shiner	**>46**													3		>1	8	>1		1	8		
creek chub	**>38**						7	>1						4			23				1		
eastern sand darter	**234**	12	1		3	7	3	1		4	2	30	4	14	10	4	1			1	31		1
emerald shiner	**>425**	43	66	3	32	14	36	>1	>1	21	11	64	3	14	33	>1	15	>1		2	3		
fathead minnow	**>14**														8			>1			1		
gizzard shad	**>43**							1>		1	1							>1					
golden redhorse	**3**														2								
goldfish	**1**																						
green sunfish	**4**											2											
greenside darter	**89**	1	1				6			1				1	1	1	3			29	13		3
johnny darter	**>135**	5	3		7	6	15	>1	>1	4	6	11	6		14	>1		>1	1	1	21		3
largemouth bass	**>2**															>1							
logperch	**>14**									1						>1		>1			6		
longnose gar	**1**																						
mimic shiner	**>138**		13							11		24		6	37		24			3		1	
northern hog sucker	**62**	8	4		2		2								11					2	12		
northern madtom	**1**											1											
pumpkinseed	**3**																			1			
rainbow darter	**>1**																	>1					
redhorse sp.	**>13**															>1				3	3		
rock bass	**3**					1															1		
rosyface shiner	**70**																				14		
round goby	**>1**																						
silver redhorse	**1**												1										
smallmouth bass	**>10**																		1		3		1
spotfin shiner	**>832**	24	52	6	74	24	33	>1	>1	44	23	75	8	9	42	>1	33	>1		119	38	8	
spottail shiner	**2**																						
stonecat	**>3**								>1					1									
striped shiner	**5**																			5			
troutperch	**>2**							>1				1											
white crappie	**>1**																	>1					
white perch	**>5**				1				>1														
white sucker	**>44**		3		3	4	2	>1				7		2	4	>1				2	6		
Total		**126**	**160**	**9**	**143**	**74**	**155**	**>10**	**>7**	**103**	**52**	**247**	**35**	**81**	**205**	**>15**	**155**	**>11**	**2**	**175**	**285**	**14**	**18**
Effort (haul)		**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**3**	**5**	**5**	**5**	**5**
CPUE (fish/haul)		**25.2**	**32**	**1.8**	**28.6**	**14.8**	**31**	**n/a**	**n/a**	**20.6**	**10.4**	**49.4**	**7**	**16.2**	**41**	**n/a**	**31**	**n/a**	**0.67**	**35**	**57**	**2.8**	**3.6**
Average CPUE (fish/haul) all sites*		**18.5**																					

*excluding sites 7, 8, 15, 17, 34, 35, 37-41

Appendix 19. Continued.

Species	Total	23	24	25	26	27	28	29	30	31	32	33a	34a	35a	36a	37a	38a	39a	40a	41a
blackside darter	**1**										1									
bluntnose minnow	**>490**		14	8		7	4	8	13		17	47		>1			>1			>1
brindled madtom	**2**																		2	
brook stickleback	**1**				1															
central stoneroller	**>60**		3								2								>1	
channel catfish	**>68**						1									>1			>1	
common carp	**1**																			
common shiner	**>46**				10	2	1	2		1	8									
creek chub	**>38**										2									
eastern sand darter	**234**					51	19	1	18		9	3			1			3		
emerald shiner	**>425**					4					15	34		>1	2	>1	>1	>1	>1	>1
fathead minnow	**>14**											4								
gizzard shad	**>43**						12	9			3	9		>1		>1	>1	>1	>1	>1
golden redhorse	**3**							1												
goldfish	**1**				1															
green sunfish	**4**																			
greenside darter	**89**	1				21	6												1	
johnny darter	**>135**		2			5	2	1			3	13		>1					>1	
largemouth bass	**>2**																		>1	
logperch	**>14**											2		>1				>1		>1
longnose gar	**1**	1																		
mimic shiner	**>138**		5	3		3									4	>1	>1	>1	>1	
northern hog sucker	**62**		1			10	1				3	6								
northern madtom	**1**																			
pumpkinseed	**3**				2															
rainbow darter	**>1**																			
redhorse sp.	**>13**				1	1	1			1	1			>1						
rock bass	**3**											1								
rosyface shiner	**70**					56														
round goby	**>1**																			>1
silver redhorse	**1**																			
smallmouth bass	**>10**			2				1	1										>1	
spotfin shiner	**>832**		9	13	27	37	14	12	33	5	33	32								>1
spottail shiner	**2**					2														
stonecat	**>3**																			>1
striped shiner	**5**																			
troutperch	**>2**																			
white crappie	**>1**																			
white perch	**>5**																	>1	>1	>1
white sucker	**>44**			1	3	1						4								
Total	**>2869**	**2**	**34**	**27**	**45**	**200**	**61**	**35**	**65**	**7**	**97**	**155**	**0**	**>6**	**7**	**>4**	**>4**	**>8**	**>12**	**>8**
Effort (hauls)		**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**n/a**	**5**	**5**	**5**	**5**	**5**	**5**	**5**
CPUE (fish/haul)		**0.4**	**6.8**	**5.4**	**9**	**40**	**12.2**	**7**	**13**	**1.4**	**19.4**	**31**	**n/a**	**n/a**	**1.4**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
Average CPUE (fish/haul) all sites*		**18.5**																		

*excluding sites 7, 8, 15, 17, 34, 35, 37-41

Appendix 20. Effort expended and species caught at seine sites in the lower Thames River, September 2004.

Species	Total	1	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
black crappie	**2**																	
blacknose dace	**1**																	
blackside darter	**5**						2											
bluntnose minnow	**3068**	150	33	168	50	110	37	48	1	12	7	163	5	134	596	14	18	91
central stoneroller	**14**	2		4		2		3							1			
channel catfish	**48**	10		7		1	3		12	2		1		3	4		5	
common shiner	**1**																	
creek chub	**2**														1			
eastern sand darter	**188**	3		4	6	5				2		4	3	76	45	6		
emerald shiner	**102**	5		0	1	1	26	26	5	4	2		4	3	3	4	4	
fantail darter	**1**							1										
fathead minnow	**3**													2	1			
ghost shiner	**226**			82	49		14	2	10	7	6	6		6	1	16	16	
gizzard shad	**86**			1		1	1			12	8	8		15	7		1	
golden redhorse	**37**			6		3	5	2	7				1	1	2			
golden shiner	**1**																	
greenside darter	**72**	3		1		4	1	4	3						6		5	1
hornyhead chub	**2**																	
johnny darter	**205**	7	26	11	22	9	3		5	1	2	15		7	23	1	2	7
largemouth bass	**1**														1			
logperch	**22**			2		3	1	4							7	1	3	
mimic shiner	**148**		2	2														74
northern hog sucker	**35**	2				24		1						2	2	1		
pumpkinseed	**1**																	
quillback	**4**										1							
rainbow darter	**1**			1														
redhorse sp.	**1**												1					
rock bass	**13**			2	1		4					1		1				
rosyface shiner	**38**																	3
shorthead redhorse	**7**		1	2					2					1			1	
silver redhorse	**2**				1	1												
smallmouth bass	**2**																	
spotfin shiner	**2192**	24	4	57	36	46	63	130	1	11	14	3	10	53	28		5	80
stonecat	**1**						1											
striped shiner	**59**																	10
troutperch	**13**			1	4		2		2		1	3						
white perch	**9**						2						3				4	
white sucker	**14**		3	1		1						1			3			
yellow perch	**1**											1						
Total		**206**	**69**	**352**	**170**	**211**	**165**	**221**	**48**	**51**	**41**	**206**	**27**	**304**	**731**	**43**	**64**	**266**
Effort (hauls)		**5**	**3**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**
CPUE (fish/haul)		**41.2**	**23**	**70.4**	**34**	**42.2**	**33**	**44.2**	**9.6**	**10.2**	**8.2**	**41.2**	**15.4**	**60.8**	**146.2**	**8.6**	**12.8**	**53.2**
Average CPUE (fish/haul) all sites		**43.4**																

Appendix 20. Continued.

Species	Total	19	20	21	22	23	24	25	26	27	28	29	30	31	32
black crappie	**2**							2							
blacknose dace	**1**														1
blackside darter	**5**	3													
bluntnose minnow	**3068**	8	181	39	94	4	77	33	399	60	14	353	16	11	142
central stoneroller	**14**							2							
channel catfish	**48**														
common shiner	**1**		1												
creek chub	**2**		1												
eastern sand darter	**188**		1	7	2		1	4	11		1	4			3
emerald shiner	**102**		1		1			10		2					
fantail darter	**1**														
fathead minnow	**3**														
ghost shiner	**226**											11			
gizzard shad	**86**			1							31				
golden redhorse	**37**	4		2	1										3
golden shiner	**1**														1
greenside darter	**72**	4	20		3	4		7		4					2
hornyhead chub	**2**		1		1										
johnny darter	**205**	3	34	1	3		3	3	3	6	2	2			4
largemouth bass	**1**														
logperch	**22**													1	
mimic shiner	**148**	25	2	1	4		3	4	22			1		2	6
northern hog sucker	**35**											2			1
pumpkinseed	**1**			1											
quillback	**4**	2								1					
rainbow darter	**1**														
redhorse sp.	**1**														
rock bass	**13**							4							
rosyface shiner	**38**	3	1		1			8		20		2			
shorthead redhorse	**7**														
silver redhorse	**2**														
smallmouth bass	**2**	2													
spotfin shiner	**2192**	18	63	21	272	53	203	424	130	76	16	66	168	63	54
stonecat	**1**														
striped shiner	**59**	10	6		28			2		2			1		
troutperch	**13**														
white perch	**9**														
white sucker	**14**	1	3									1			
yellow perch	**1**														
Total	**6628**	**83**	**315**	**73**	**410**	**61**	**287**	**503**	**565**	**171**	**64**	**442**	**185**	**77**	**217**
Effort (hauls)		**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**
CPUE (fish/haul)		**16.6**	**63**	**14.6**	**82**	**12.2**	**57.4**	**100.6**	**113**	**34.2**	**12.8**	**88.4**	**37**	**15.4**	**43.4**
Average CPUE (fish/haul) all sites		**43.4**													

Appendix 21. Effort expended and species caught at sixteen comparable seine sites in the lower Thames River, July, August and September 2004. Comparable sites are those sites with completed catch data for each month sampled.

			July															
Species	**% Composition**	**Total**	**1a**	**12a**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**
blacknose dace	**0.06**	**1**															1	
blackside darter	**0.12**	**2**		1										1				
bluntnose minnow	**20.12**	**340**	32	40	48	61	4	2	4		52		14	14	35	3	19	12
central stoneroller	**1.06**	**18**				11					1	1	1	1			1	2
common shiner	**0.35**	**6**							6									
creek chub	**0.24**	**4**												1			1	2
eastern sand darter	**1.89**	**32**	8		7	3	3		1			7		1		2		
emerald shiner	**5.21**	**88**	55	22	2	1										4	3	1
fathead minnow	**0.24**	**4**		2		1							1					
golden redhorse	**0.12**	**2**			1	1												
green sunfish	**0.06**	**1**				1												
greenside darter	**1.30**	**22**			11	8					3							
johnny darter	**4.85**	**82**		34	19	16	1		2	3		4		3				
logperch	**0.18**	**3**	2									1						
longnose gar	**0.06**	**1**														1		
mimic shiner	**8.81**	**149**		39	70	7	4		1	1	22		4			1		
northern hog sucker	**3.73**	**63**	11		3	35	1		2	1	1	2		3		4		
pumpkinseed	**0.24**	**4**			3						1							
quillback	**1.30**	**22**			14				1		2	4						1
redhorse sp.	**2.78**	**47**	4		39		3										1	
rock bass	**0.24**	**4**			2	2												
rosyface shiner	**1.18**	**20**			12	8												
silver redhorse	**1.43**	**24**			6		1		17									
smallmouth bass	**1.71**	**29**			8	6		1	5	2	1	3			3			
spotfin shiner	**37.04**	**626**	22	13	160	91	31	7	2	6	91	64	32	26	13	47	5	16
striped shiner	**0.89**	**15**			7	8												
troutperch	**0.53**	**9**		9														
white sucker	**4.20**	**71**		13	8	16	2	1	1		2	2			9		16	1
yellow perch	**0.06**	**1**					1											
Total	**100**	**1690**	**134**	**173**	**420**	**276**	**51**	**11**	**42**	**13**	**176**	**88**	**52**	**50**	**60**	**62**	**47**	**35**
Effort (hauls)			**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**
CPUE (fish/haul)			**26.8**	**34.6**	**84**	**55.2**	**10.2**	**2.2**	**8.4**	**2.6**	**35.2**	**17.6**	**10.4**	**10**	**12**	**12.4**	**9.4**	**7**
Average CPUE (fish/haul) all sites			21.12															

Appendix 21. Continued.

			August															
Species	**% Composition**	**Total**	**1a**	**12a**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**
blackside darter	**0.08**	**1**																1
bluntnose minnow	**19.74**	**242**	22	13	5	116	5	10		14	8		7	4	8	13		17
brook stickleback	**0.08**	**1**										1						
central stoneroller	**1.87**	**23**	11		1	6				3								2
channel catfish	**0.08**	**1**												1				
common shiner	**2.70**	**33**			1	8						10	2	1	2		1	8
creek chub	**0.24**	**3**				1												2
eastern sand darter	**12.00**	**147**	12	4	1	31		1					51	19	1	18		9
emerald shiner	**5.71**	**70**	43	3	2	3							4					15
fathead minnow	**0.08**	**1**				1												
gizzard shad	**1.96**	**24**												12	9			3
golden redhorse	**0.08**	**1**													1			
goldfish	**0.08**	**1**										1						
green sunfish	**0.16**	**2**				2												
greenside darter	**6.03**	**74**	1		29	13		3	1				21	6				
johnny darter	**4.00**	**49**	5	6	1	21		3		2			5	2	1			3
logperch	**0.49**	**6**				6												
longnose gar	**0.08**	**1**							1									
mimic shiner	**1.22**	**15**			3		1			5	3		3					
northern hog sucker	**3.02**	**37**	8		2	12				1			10	1				3
pumpkinseed	**0.24**	**3**			1							2						
redhorse sp.	**0.90**	**11**			3	3						1	1	1			1	1
rock bass	**0.08**	**1**				1												
rosyface shiner	**5.71**	**70**				14							56					
silver redhorse	**0.08**	**1**		1														
smallmouth bass	**0.65**	**8**				3		1			2				1	1		
spotfin shiner	**31.00**	**380**	24	8	119	38	8			9	13	27	37	14	12	33	5	33
spottail shiner	**0.16**	**2**											2					
striped shiner	**0.41**	**5**			5													
white sucker	**1.07**	**13**			2	6					1	3	1					
Total	**100**	**1226**	**126**	**35**	**175**	**285**	**14**	**18**	**2**	**34**	**27**	**45**	**200**	**61**	**35**	**65**	**7**	**97**
Effort (hauls)			**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**
CPUE (fish/haul)			**25.2**	**7**	**35**	**57**	**2.8**	**3.6**	**0.4**	**6.8**	**5.4**	**9**	**40**	**12.2**	**7**	**13**	**1.4**	**19.4**
Average CPUE (fish/haul) all sites			**15.32**															

Appendix 21. Continued.

			September															
Species	**% Composition**	**Total**	**1a**	**12a**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**
black crappie	**0.05**	**2**									2							
blacknose dace	**0.02**	**1**																1
blackside darter	**0.08**	**3**			3													
bluntnose minnow	**45.12**	**1744**	150	163	8	181	39	94	4	77	33	399	60	14	353	16	11	142
central stoneroller	**0.10**	**4**	2								2							
channel catfish	**0.28**	**11**	10	1														
common shiner	**0.02**	**1**				1												
creek chub	**0.02**	**1**				1												
eastern sand darter	**1.05**	**41**	3	4		1	7	2		1	4	11		1	4			3
emerald shiner	**0.49**	**19**	5			1		1			10		2					
ghost shiner	**0.44**	**17**		6											11			
gizzard shad	**1.03**	**40**		8			1							31				
golden redhorse	**0.26**	**10**			4		2	1										3
golden shiner	**0.02**	**1**																1
greenside darter	**1.21**	**47**	3		4	20		3	4		7		4					2
hornyhead chub	**0.05**	**2**				1		1										
johnny darter	**2.22**	**86**	7	15	3	34	1	3		3	3	3	6	2	2			4
logperch	**0.02**	**1**															1	
mimic shiner	**1.81**	**70**			25	2	1	4		3	4	22			1		2	6
northern hog sucker	**0.13**	**5**	2												2			1
pumpkinseed	**0.02**	**1**					1											
quillback	**0.08**	**3**			2								1					
rock bass	**0.13**	**5**		1							4							
rosyface shiner	**0.90**	**35**			3	1		1			8		20		2			
smallmouth bass	**0.05**	**2**			2													
spotfin shiner	**42.79**	**1654**	24	3	18	63	21	272	53	203	424	130	76	16	66	168	63	54
striped shiner	**1.27**	**49**			10	6		28			2		2			1		
troutperch	**0.08**	**3**		3														
white sucker	**0.15**	**6**		1	1	3									1			
yellow perch	**0.02**	**1**		1														
Total	**100**	**3865**	**206**	**206**	**83**	**315**	**73**	**410**	**61**	**287**	**503**	**565**	**171**	**64**	**442**	**185**	**77**	**217**
Effort (hauls)			**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**
CPUE (fish/haul)			**41.2**	**41.2**	**16.6**	**63**	**14.6**	**82**	**12.2**	**57.4**	**100.6**	**113**	**34.2**	**12.8**	**88.4**	**37**	**15.4**	**43.4**
Average CPUE (fish/haul) all sites			**48.31**															

Appendix 22. Effort expended and species caught at backpack electrofishing sites in Thames River tributaries, 2004.

Species	% Comp.	Total	2	4	5	6	7	8b	9	10	11	12	14
black bullhead	0.15	3											2
blacknose dace	4.66	90							9				
blackside darter	0.31	6											
bluegill	1.14	22			1								
bluntnose minnow	16.88	326	74	17			2	49	3	15	1	20	
brook stickleback	4.04	78			4		3	20					47
brown bullhead	0.67	13		1	11								
central mudminnow	11.81	228			28	15		3					169
central stoneroller	0.88	17	16							1			
common carp	0.21	4			1							2	
common shiner	3.52	68						2		3		14	
creek chub	8.85	171	11	1		3		17	11	18	4	1	1
emerald shiner	1.45	28	13	9									
fantail darter	0.78	15	8								7		
fathead minnow	0.93	18	1				13			4			
gizzard shad	0.10	2										2	
golden shiner	0.21	4	1					2					
goldfish	0.10	2											
grass pickerel	0.41	8											
green sunfish	5.07	98	6	1	1	3			8				7
greenside darter	0.47	9	6								3		
Iowa darter	0.05	1		1									
johnny darter	5.54	107	4	14	2	3	7	7				2	
largemouth bass	0.36	7	2		2								
least darter	6.94	134			1		7	27					2
logperch	1.55	30	13	6					2		9		
northern hog sucker	0.62	12	12										
northern pike	0.21	4			3								
northern redbelly dace	0.67	13					12	1					
pumpkinseed	1.60	31	4		1			1				1	
quillback	0.15	3											
rainbow trout	0.05	1	1										
rock bass	4.5	87	28	4	3	1		1	2	1	4		
shorthead redhorse	0.31	6	4										
smallmouth bass	0.05	1	1										
spotfin shiner	4.56	88	28	14				11			1		
stonecat	0.10	2	1								1		
tadpole madtom	1.09	21											
tubenose goby	0.05	1											
white sucker	6.78	131	11		8	1	2	5	2	5	4	2	15
yellow bullhead	0.31	6											
yellow perch	1.81	35			17	1		1		6			
Total	100	1931	245	68	83	27	46	147	37	53	34	44	243
Effort (hours)			1.37	0.26	0.23	0.41	0.08	0.13	0.35	0.16	0.46	0.27	0.28
CPUE (fish/hour)			178.9	261.5	361	65.8	575	1137.8	105.7	331.2	73.9	163	868
Average CPUE (fish/hour) all sites*			414.3										

Appendix 22. Continued.

Species	% Comp.	Total	15	16	17	18	19	20	21	23	24b	25	28
black bullhead	**0.15**	**3**											1
blacknose dace	**4.66**	**90**	1	21	36		23						
blackside darter	**0.31**	**6**								1	2	3	
bluegill	**1.14**	**22**						3	10	1		1	6
bluntnose minnow	**16.88**	**326**	10	2		34			8	20	54	5	12
brook stickleback	**4.04**	**78**	4										
brown bullhead	**0.67**	**13**						1					
central mudminnow	**11.81**	**228**	13										
central stoneroller	**0.88**	**17**											
common carp	**0.21**	**4**										1	
common shiner	**3.52**	**68**				6				3	36	4	
creek chub	**8.85**	**171**	10	13	40		23	7		9	1	1	
emerald shiner	**1.45**	**28**							6				
fantail darter	**0.78**	**15**											
fathead minnow	**0.93**	**18**											
gizzard shad	**0.10**	**2**											
golden shiner	**0.21**	**4**	1										
goldfish	**0.10**	**2**								1			1
grass pickerel	**0.41**	**8**								8			
green sunfish	**5.07**	**98**		1		1	7	14	42		1	1	5
greenside darter	**0.47**	**9**											
Iowa darter	**0.05**	**1**											
johnny darter	**5.54**	**107**	10	4	2	17	1	23	1		5	5	
largemouth bass	**0.36**	**7**	1						2				
least darter	**6.94**	**134**	9							78	5	5	
logperch	**1.55**	**30**											
northern hog sucker	**0.62**	**12**											
northern pike	**0.21**	**4**						1					
northern redbelly dace	**0.67**	**13**											
pumpkinseed	**1.60**	**31**	1					1					22
quillback	**0.15**	**3**						1		1	1		
rainbow trout	**0.05**	**1**											
rock bass	**4.5**	**87**	1						4		3		35
shorthead redhorse	**0.31**	**6**						2					
smallmouth bass	**0.05**	**1**											
spotfin shiner	**4.56**	**88**		2						4	21	7	
stonecat	**0.10**	**2**											
tadpole madtom	**1.09**	**21**						2		8	4	7	
tubenose goby	**0.05**	**1**											1
white sucker	**6.78**	**131**	4	3				1		54	3	11	
yellow bullhead	**0.31**	**6**						4	1		1		
yellow perch	**1.81**	**35**						1	1				8
Total	**100**	**1931**	**65**	**46**	**78**	**58**	**54**	**61**	**75**	**188**	**137**	**51**	**91**
Effort (hours)			**0.15**	**0.24**	**0.23**	**0.25**	**0.17**	**0.22**	**0.33**	**0.48**	**0.11**	**0.10**	**0.11**
CPUE (fish/hour)			**433.3**	**191.7**	**339.1**	**232**	**317.6**	**277.3**	**227.3**	**391.7**	**1245.4**	**510**	**827.3**
Average CPUE (fish/hour) all sites			**414.3**										

Appendix 23. Effort expended and species caught at seine net sites in Thames River tributaries, 2004.

Species	% Composition	Total	1	3	8a	13	22	24a	26	27
black crappie	0.89	10					10			
blackside darter	0.09	1						1		
bluegill	4.28	48	4	6			30			8
bluntnose minnow	13.90	156	1	1	2	5	2	127		18
brook stickleback	0.18	2			2					
central mudminnow	0.18	2							2	
channel catfish	0.27	3	2					1		
common carp	0.09	1					1			
common shiner	17.20	193			1	17		175		
creek chub	0.27	3			3					
emerald shiner	1.78	20		2		5	5			8
fathead minnow	0.36	4			4					
ghost shiner	11.14	125	8	99			8			10
gizzard shad	4.28	48	1	47						
golden shiner	0.44	5				1			3	1
grass pickerel	0.09	1					1			
green sunfish	0.71	8					6		2	
johnny darter	3.21	36			2			33		1
largemouth bass	0.09	1								1
logperch	0.09	1						1		
longnose gar	0.27	3					3			
mimic shiner	0.09	1		1						
northern pike	0.18	2					2			
northern redbelly dace	0.09	1			1					
pumpkinseed	0.27	3							1	2
quillback	0.09	1					1			
rock bass	0.36	4	2							2
round goby	1.25	14	12	2						
shiner sp.	0.53	6	6							
spotfin shiner	7.66	86				17		29		40
tadpole madtom	0.44	5						5		
white crappie	27.45	308	253	50			5			
white perch	0.36	4	2	1		1				
white sucker	1.07	12						11	1	
yellow bullhead	0.09	1						1		
yellow perch	0.27	3					1	1	1	
Total	**100**	**1122**	**291**	**209**	**15**	**46**	**75**	**385**	**10**	**91**
Effort (hauls)			**2**	**2**	**1**	**2**	**4**	**5**	**3**	**2**
CPUE (fish/haul)			**145.5**	**104.5**	**15**	**23**	**18.7**	**77**	**3.3**	**45.5**
Average CPUE (fish/haul) all sites			54.07							

Appendix 24. Effort expended and species captured at boat electrofishing sites on the lower Thames River, July 2004.

Species	% Comp.	Total	1b	2b	3b	4b	5b	6b	7b	8b	9b	10b	12b	13b	14b	15b	16b	17b
blackside darter	**0.66**	**3**						1			2							
bluntnose minnow	**17.90**	**81**	26	3	5	5	13				7	4	7		4	7		
channel catfish	**4.39**	**20**				1		1					4	1	1	4	2	6
common carp	**2.42**	**11**			2		1	1					3	1	2		1	
eastern sand darter	**2.20**	**10**		1		1	1				3	1				3		
emerald shiner	**33.20**	**151**	47	9	13	12	13	6	8		23		4	2	5	9		
fathead minnow	**0.44**	**2**											2					
freshwater drum	**1.54**	**7**										1	2			4		
golden redhorse	**1.98**	**9**											3		1	4	1	
green sunfish	**0.22**	**1**									1							
greenside darter	**1.10**	**5**	2	1		1			1									
johnny darter	**1.54**	**7**	1	1							1		2			2		
largemouth bass	**0.22**	**1**						1										
logperch	**3.51**	**16**	1			1			2		1	5	2	1	1	2		
longnose gar	**0.88**	**4**	1		1									1		1		
mimic shiner	**1.32**	**6**							1				4			1		
northern hog sucker	**3.29**	**15**	1	1						3		2	3				2	3
pumpkinseed	**0.22**	**1**									1							
rainbow darter	**0.22**	**1**					1											
rock bass	**0.44**	**2**					1						1					
shorthead redhorse	**6.37**	**29**								2			8	1	1	5	3	9
silver redhorse	**2.42**	**11**				1		1			1	1		2	1	1	2	1
smallmouth bass	**1.32**	**6**	2				1		1				2					
spotfin shiner	**8.35**	**38**		3		2			1		22	5	1	1	1	2		
troutperch	**0.22**	**1**											1					
white bass	**0.44**	**2**				2												
white perch	**1.10**	**5**											1	1		1	1	1
white sucker	**1.54**	**7**							1		1				1	3		1
yellow perch	**0.66**	**3**					1	1					1					
Total	**100**	**455**	**81**	**19**	**21**	**26**	**32**	**12**	**15**	**5**	**63**	**19**	**51**	**11**	**18**	**49**	**12**	**21**
Effort (hours)			**0.18**	**0.18**	**n/a**	**n/a**	**0.17**	**0.15**	**0.16**	**n/a**	**0.18**	**n/a**	**0.31**	**n/a**	**n/a**	**0.17**	**0.17**	**0.15**
CPUE (fish/hour)			**450**	**105.5**	**n/a**	**n/a**	**188.2**	**80**	**93.7**	**n/a**	**350**	**n/a**	**164.5**	**n/a**	**n/a**	**288.2**	**70.6**	**140**
Average CPUE (fish/hour) all sites*			**193.1**															

*excluding sites 3, 4, 8, 10, 13, 14

Appendix 25. Effort expended and species captured at boat electrofishing sites on the lower Thames River, August 2004.

Species	% Composition	Total	1b	2b	3b	4b	5b	6b	7b	8b	9b	10b	11b	12b	13b
blackside darter	**0.14**	**1**						1							
bluntnose minnow	**3.67**	**25**	1	1		2	7	7			1	2	2		
brook silverside	**0.29**	**2**													
central stoneroller	**0.29**	**2**						2							
channel catfish	**7.61**	**52**		1			3	1	7		3		5	2	
common carp	**1.46**	**10**											4		
eastern sand darter	**0.14**	**1**				1									
emerald shiner	**7.03**	**48**	2	2	1	17		5				4	2	1	
freshwater drum	**1.62**	**11**							2						
gizzard shad	**17.00**	**116**			18	2	2	1	3		51	13	3		
golden redhorse	**5.86**	**40**	2	2			4	1	6	3			1	2	1
greenside darter	**0.29**	**2**					1								
johnny darter	**0.14**	**1**									1				
largemouth bass	**0.14**	**1**													
logperch	**2.34**	**16**	5				1		3		1			1	
longnose gar	**0.14**	**1**													
mimic shiner	**3.36**	**23**					9		1		4		1		
mooneye	**0.14**	**1**													
northern hog sucker	**10.70**	**73**	3	3	1	4	3		1	15	6		1	3	5
pumpkinseed	**0.14**	**1**										1			
rainbow trout	**0.14**	**1**													
rock bass	**0.29**	**2**											1		
shorthead redhorse	**13.98**	**95**	7			3	8	4	4	14	4	1	3	8	4
silver redhorse	**4.68**	**32**	2	1	5	2	2	1		3			4		1
smallmouth bass	**1.17**	**8**					1			2	1	1		1	
spotfin shiner	**8.20**	**56**	1	1	2	11	14	8			8	2	1	2	
stonecat	**0.29**	**2**								1					
walleye	**0.29**	**2**											1		
white bass	**2.05**	**14**								4			1		
white perch	**5.85**	**40**	1	2			4		1	1	1	1		1	1
white sucker	**0.44**	**3**				1					1		1		
yellow perch	**0.14**	**1**													
Total	**100**	**683**	**24**	**13**	**27**	**43**	**59**	**31**	**28**	**43**	**82**	**25**	**31**	**21**	**12**
Effort (hours)			**0.14**	**0.17**	**n/a**	**0.17**	**0.17**	**0.17**	**0.18**	**0.16**	**0.17**	**0.16**	**0.18**	**0.16**	**0.17**
CPUE (fish/hour)			**171.4**	**76.5**	**n/a**	**252.9**	**347.8**	**182.3**	**155.5**	**268.7**	**482.3**	**156.2**	**172.2**	**131.2**	**70.6**
Average CPUE (fish/hour) all sites*			**194.96**												

*excluding sites 3, 14, 15

Appendix 25. Continued.

Species	% Composition	Total	14b	15b	16b	17b	33b	34b	35b	36b	37b	38b	39b	40b	41b
blackside darter	0.14	1													
bluntnose minnow	3.67	25			1				1						
brook silverside	0.29	2													2
central stoneroller	0.29	2													
channel catfish	7.61	52	7		1	4	5				11		2		
common carp	1.46	10			1		1		1		1		1		1
eastern sand darter	0.14	1													
emerald shiner	7.03	48			1			1	2	1	1	2	3	2	1
freshwater drum	1.62	11	1		3	1		1			1	1			1
gizzard shad	17.00	116			3			1			9		2	6	2
golden redhorse	5.86	40	1		1		1	1			7	3	3		1
greenside darter	0.29	2	1												
johnny darter	0.14	1													
largemouth bass	0.14	1													1
logperch	2.34	16		1	1		1						1		1
longnose gar	0.14	1								1					
mimic shiner	3.36	23			2					1	3		1	1	
mooneye	0.14	1										1			
northern hog sucker	10.70	73	4	7		6	1				4	5	1		
pumpkinseed	0.14	1													
rainbow trout	0.14	1					1								
rock bass	0.29	2			1										
shorthead redhorse	13.98	95	4	2		17	1				9	1	1		
silver redhorse	4.68	32	2	1	1	1	1				3			2	
smallmouth bass	1.17	8	1										1		
spotfin shiner	8.20	56			1		1			2					2
stonecat	0.29	2			1										
walleye	0.29	2									1				
white bass	2.05	14					1				2	5	1		
white perch	5.85	40	1	2	2	5	5				8		4		
white sucker	0.44	3													
yellow perch	0.14	1							1						
Total	100	683	22	13	20	34	19	4	5	5	60	18	21	11	12
Effort (hours)			n/a	n/a	0.18	0.17	0.17	0.15	0.17	0.18	0.18	0.17	0.17	0.17	0.15
CPUE (fish/hour)			n/a	n/a	111.1	200	111.8	26.7	29.4	27.8	333.3	106	123.5	64.8	880
Average CPUE (fish/hour) all sites*			194.96												

*excluding sites 3, 14, 15

Appendix 26. Effort expended and species caught at nine comparable boat electrofishing sites on the lower Thames River, July and August 2004. Comparable sites are those sites with completed catch data for each month sampled.

July											
Species	**% Composition**	**Total**	**1b**	**2b**	**5b**	**6b**	**7b**	**9b**	**12b**	**16b**	**17b**
blackside darter	0.99	3				1		2			
bluntnose minnow	18.37	56	26	3	13			7	7		
channel catfish	4.25	13				1			4	2	6
common carp	1.97	6			1	1			3	1	
eastern sand darter	1.63	5		1	1			3			
emerald shiner	35.95	110	47	9	13	6	8	23	4		
fathead minnow	0.65	2							2		
freshwater drum	0.65	2							2		
golden redhorse	1.31	4							3	1	
green sunfish	0.32	1						1			
greenside darter	1.31	4	2	1			1				
johnny darter	1.63	5	1	1				1	2		
largemouth bass	0.32	1				1					
logperch	1.97	6	1				2	1	2		
longnose gar	0.32	1	1								
mimic shiner	1.63	5					1		4		
northern hog sucker	3.27	10	1	1					3	2	3
pumpkinseed	0.32	1						1			
rainbow darter	0.32	1			1						
rock bass	0.65	2			1				1		
shorthead redhorse	6.53	20							8	3	9
silver redhorse	1.63	5				1		1		2	1
smallmouth bass	1.97	6	2		1		1		2		
spotfin shiner	8.82	27		3			1	22	1		
troutperch	0.32	1							1		
white perch	0.99	3							1	1	1
white sucker	0.99	3					1	1			1
yellow perch	0.99	3			1	1			1		
Total	100	306	81	19	32	12	15	63	51	12	21
Effort (hours)			0.18	0.18	0.17	0.15	0.16	0.18	0.31	0.17	0.15
CPUE (fish/hour)			450	105.5	188.2	80	93.7	350	164.5	70.6	140
Average CPUE (fish/hour)			182.5								

Appendix 26. Continued.

			August								
Species	**% Composition**	**Total**	**1b**	**2b**	**5b**	**6b**	**7b**	**9b**	**12b**	**16b**	**17b**
blackside darter	**0.33**	**1**				1					
bluntnose minnow	**6.67**	**20**	1	1	7	7		1		1	
central stoneroller	**0.66**	**2**				2					
channel catfish	**9.00**	**27**		1	3	1	7	3	2	1	4
common carp	**1.66**	**5**								1	
emerald shiner	**4.33**	**13**	2	2		5			1	1	
freshwater drum	**2.00**	**6**					2			3	1
gizzard shad	**21.00**	**63**			2	1	3	51		3	
golden redhorse	**6.33**	**19**	2	2	4	1	6		2	1	
greenside darter	**0.33**	**1**			1						
johnny darter	**0.33**	**1**						1			
logperch	**4.00**	**12**	5		1		3	1	1	1	
mimic shiner	**5.66**	**17**			9		1	4		2	
northern hog sucker	**8.67**	**26**	3	3	3		1	6	3		6
rock bass	**0.66**	**2**								1	
shorthead redhorse	**18.33**	**55**	7		8	4	4	4	8		17
silver redhorse	**4.00**	**12**	2	1	2	1				1	1
smallmouth bass	**1.00**	**3**			1			1	1		
spotfin shiner	**8.00**	**24**	1	1	2	8		8	2	1	
stonecat	**0.33**	**1**								1	
walleye	**0.33**	**1**									
white bass	**0.33**	**1**									
white perch	**5.67**	**17**	1	2	4		1	1	1	2	5
white sucker	**0.66**	**2**						1			
Total	100	300	**24**	**13**	**47**	**31**	**28**	**82**	**21**	**20**	**34**
Effort (hours)			**0.14**	**0.17**	**0.17**	**0.17**	**0.18**	**0.17**	**0.16**	**0.18**	**0.17**
CPUE (fish/hour)			**171.4**	**76.5**	**276.5**	**182.3**	**155.5**	**482.3**	**131.2**	**111.1**	**200**
Average CPUE (fish/hour) all sites			**198.53**								

Appendix 27. Habitat data at the lower Thames River sites, 2003.

Site	Date	Air Temp. (°C)	Water Temp. (°C)	Cond. (µs)	Secchi Depth (m)	Stream Width (m)	Max Stream Depth (m)	Distance From Shore (m)	Max Sampling Depth (m)	Flow Rate	Aquatic Veg. Type (%)	Substrate Type (%)*
1	15/07/03	n/a	n/a	n/a	n/a	35	3	20	3	Slow (pool)	None	n/a
2	15/07/03	n/a	n/a	n/a	n/a	200	n/a	10	1	Slow (pool)	None	n/a
3	15/07/03	n/a	n/a	n/a	n/a	20	n/a	3	n/a	Slow	None	n/a
4	16/07/03	n/a	n/a	n/a	n/a	150	n/a	75	4	None	None	C100 (?)
5	16/07/03	n/a	n/a	n/a	n/a	100	>2	100	n/a	Slow (pool)	None	n/a
6	16/07/03	n/a	n/a	n/a	n/a	35	>2	35	>2	Slow (pool)	None	n/a
7	17/07/03	n/a	n/a	n/a	n/a	200	n/a	10	1	Slow (pool)	None	n/a
8	17/07/03	n/a	n/a	n/a	n/a	150	4	75	4	Slow (pool)	None	C100 (?)
9	17/07/03	n/a	n/a	n/a	n/a	200	n/a	10	1	Slow (pool)	None	n/a
10	23/07/03	n/a	n/a	n/a	0.45	100	n/a	5	0.6	Slow (pool)	None	n/a
11	23/07/03	n/a	n/a	n/a	n/a	100	n/a	5	>3	Slow (pool)	None	n/a
12	24/07/03	n/a	n/a	n/a	n/a	n/a	n/a	5	>1	Slow (pool)	None	n/a
13	24/07/03	n/a	n/a	n/a	n/a	n/a	n/a	5	<3	n/a	None	n/a
14	24/07/03	n/a	n/a	n/a	n/a	n/a	n/a	5	>1	Slow (pool)	None	n/a
15	24/07/03	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Slow (pool)	None	n/a
16	29/07/03	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Slow (pool)	None	n/a
17	29/07/03	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Slow (pool)	None	n/a
18	29/07/03	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Slow (pool)	None	n/a
19a	29/07/03	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	None	n/a
19b	03/09/03	n/a	23.8	268	n/a	30	n/a	3	n/a	Slow (pool)	None	n/a
20a	29/07/03	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Slow (pool)	None	n/a
20b	03/09/03	n/a	23.8	268	n/a	30	n/a	3	n/a	Slow (pool)	None	n/a
21a	29/07/03	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Slow (pool)	None	n/a
21b	03/09/03	n/a	23.8	268	n/a	30	n/a	3	n/a	Slow (pool)	None	n/a
22a	30/07/03	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Slow (pool)	None	n/a
22b	03/09/03	n/a	23.8	268	n/a	30	n/a	3	n/a	Slow (pool)	None	n/a
23a	30/07/03	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Slow (pool)	None	n/a
23b	03/09/03	n/a	23.8	268	n/a	30	n/a	3	n/a	Slow (pool)	None	n/a
24a	30/07/03	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Slow (pool)	None	n/a
24b	03/09/03	n/a	23.8	268	n/a	30	n/a	3	n/a	Slow (pool)	None	n/a
25	30/07/03	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Slow (pool)	None	n/a
26	30/07/03	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Slow (pool)	None	n/a
27	30/07/03	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Slow (pool)	None	n/a
28a	31/07/03	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Slow (pool)	None	n/a

Appendix 27. Continued.

Site	Date	Air Temp. (°C)	Water Temp. (°C)	Cond. (µs)	Secchi Depth (m)	Stream Width (m)	Max Stream Depth (m)	Dist. From Shore (m)	Max Sampling Depth (m)	Flow Rate	Aquatic Veg Type (%)	Substrate T (%)*
28b	03/09/03	n/a	23.8	268	n/a	30	n/a	3	n/a	Slow (pool)	None	
29	31/07/03	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Slow (pool)	None	
30a	31/07/03	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Slow (pool)	None	
30b	03/09/03	n/a	23.7	268	n/a	30	n/a	3	n/a	Slow (pool)	None	
31	31/07/03	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Slow (pool)	None	
32a	31/07/03	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Slow (pool)	None	
32b	03/09/03	n/a	23.8	268	n/a	30	n/a	3	n/a	Slow (pool)	None	
33	31/07/03	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Slow (pool)	None	
34	23/09/03	n/a	18.4	589	0.3	50	1.5	50	1.5	Riffle/run	None	
35	23/09/03	n/a	18.6	583	0.2	30	2	30	2	Riffle/run	None	G50/SD30/
36	23/09/03	n/a	n/a	n/a	n/a	30	3.5	0	3.5	Slow (riffle/run)	None	SD50
37	23/09/03	n/a	n/a	n/a	n/a	30	3.5	0	3.5	Slow (riffle)	None	SD40/G40/C
38	23/09/03	n/a	n/a	n/a	n/a	30	1.8	0-15	1	Slow (riffle/pool)	None	SD40/C40
39	23/09/03	n/a	n/a	n/a	n/a	30	2	0-7	0.7	Slow (run)	None	SD50/C25/
40	24/09/03	19.9	16.8	540	n/a	30	1.5	0	1.5	Medium (run)	None	
41	24/09/03	19.3	17.4	525	n/a	30	1.5	0	1.5	Medium	None	
42	24/09/03	23.1	17.7	527	n/a	30	3.5	0	2	Medium	None	
43	24/09/03	17.1	16.8	531	0.2	25	2	0	2	Medium	None	
44	24/09/03	19.1	17.1	540	0.3	25	2	0	2	Medium/fast (riffle/run/pool)	None	
45	24/09/03	17.1	20.1	526	0.3	30	1.5	0	1	Fast (riffle/run)	None	
46	24/09/03	19.5	16.5	524	0.2	30	1.5	0-7	0.8	Slow (run)	None	
47	24/09/03	19.5	16.7	531	0.2	25	2	0-7	1	Slow/medium (riffle/run)	None	
48	24/09/03	20.1	17.1	532	0.2	30	2	0-7	0.7	Slow (run)	None	
49	24/09/03	19.1	17.3	540	0.2	30	2.5	0-5	1	Slow (run/pool)	Grass (10)	
50	24/09/03	18.5	16.9	541	0.2	25	2	0-7	0.4	Slow (riffle)	None	SD40/C30
51	24/09/03	13.5	15.2	656	0.3	25	1.75	0-7	1	Slow/medium (run)	None	SD40/G30

*SD – sand; G – gravel; CO – cobble; ST – silt; C – clay

Appendix 28. Habitat data at lower Thames River sites, 2004.

July												
Site	**Date**	**Air Temp. (°C)**	**Water Temp. (°C)**	**Cond. (µs)**	**Stream Width (m)**	**Secchi Depth (m)**	**Max Stream Depth (m)**	**Distance from Shore (m)**	**Max. Sampling Depth (m)**	**Flow Rate (riffle/run/pool)**	**Aquatic Vegetation (Type/%)***	**Substrate (Type%)****
1a+b	14/07/04	24.9	24.2	608	25	0.27	1.5	25	1	Fast (riffle)	None	SD35/G15/ C50
2a+b	14/07/04	25.2	24.4	604	35	0.32	1	35	1	Fast (riffle)	None	C40/SD30/G30
3a+b	14/07/04	20.2	23.2	586	25	0.29	1.5	25	1.5	Medium (run)	None	C60/SD20/ST10/G10
4a+b	14/07/04	19.4	23.2	637	20	0.3	1	20	1	Fast (riffle)	None	G60/SD20/C20
5a+b	15/07/04	20.9	22.9	594	25	0.23	1.2	25	1.2	Slow (run)	None	SD50/G35/C15
6a+b	15/07/04	21.8	22.7	586	20	0.25	n/a	n/a	n/a	Medium (run)	None	G60/SD20/G20
7a+b	15/07/04	23.5	22.7	592	25	0.32	1	25	1	Fast (riffle)	None	G40/B25/SD20/C15
8a+b	15/07/04	23.7	22.8	589	30	0.25	1.5	30	1.5	Fast (riffle)	None	G60/SD20/C15/B5
9a+b	15/07/04	23.9	23.0	602	20	0.23	2	20	2	Medium (run)	None	C40/SD30/G30
10a+b	15/07/04	22.7	22.8	603	20	0.25	1.2	20	1.2	Medium (run)	None	SD30/G30/C30/ST10
11a	15/07/04	23.9	22.1	601	n/a	0.25	n/a	n/a	n/a	Slow (run)	None	SD50/C40/ST10
12a+b	20/07/04	25.1	24.3	603	20	0.25	1.5	n/a	1.5	Slow (run)	None	n/a
13a+b	20/07/04	26.7	24.1	608	25	0.25	1	25	1	Medium (run)	None	SD50/C30/ST10/O10
14a+b	20/07/04	26.1	25.4	617	20	0.25	1	10	1	Slow (run)	None	G50/SD40/C10
15a+b	20/07/04	26.0	25.2	603	20	0.25	1.5	0	1.5	Medium (run)	None	SD50/C40/G10
16a+b	21/07/04	27.4	24.8	601	30	0.25	1	30	1	Slow (run)	None	G60/SD40
17a+b	21/07/04	28.3	25.2	601	27	0.22	1.5	0	0.5	Slow/Medium (run)	None	G40/C30/SD30
18	28/07/04	21.1	20.4	684	35	0.4	1	15	1	Slow (run)	None	SD60/ST40
19	28/07/04	21.4	n/a	n/a	50	1.0	1	15	0.5	Slow (run)	E 10	SD95/O5
20	28/07/04	24.1	22.7	658	40	1.2	1.2	10	0.5	Medium (riffle/run)	None	G80/SD20
21	29/07/04	22.7	22	659	30	0.25	1.5	5	0.8	Medium (run)	None	SD90/C5/O5
22	04/08/04	19.0	21.9	608	25	0.4	0.4	4	0.4	Fast (run)	None	SD80/G20
23	04/08/04	18.6	21.2	609	35	1.0	1	5	0.5	Medium (run)	None	SD50/G40/ST10
24	04/08/04	17.4	21.3	604	50	n/a	1	1-10	0.5	Slow (run)	None	SD50/G50
25	04/08/04	16.8	21.2	609	25	0.4	1.2	n/a	n/a	Medium (run)	None	SD75/C20/G5
26	04/08/04	17.7	21.1	610	30	n/a	1.8	1-3	0.8	Medium (run)	None	G50/SD40/ST10
27	04/08/04	20.1	21.4	604	20	0.4	1.5	3	0.5	Medium (run)	None	SD70/G30
28	04/08/04	21.7	22	601	25	0.3	1.5	1-3	0.5	Slow (run)	None	SD80/G15/ST5
29	04/08/04	15.1	20.2	576	30	n/a	n/a	7.0	1.1	Slow (pool)	E 10	ST40/C40/SD20
30	05/08/04	16.4	20.7	580	30	0.25	1.5	8.0	1.2	n/a	E 10	SD90/ST5/C5
31	05/08/04	21.5	21.9	574	40	n/a	n/a	5.0	1.3	Slow (run)	None	SD75/ST20/O5
32	05/08/04	24.1	23.2	566	20	n/a	2	6.0	1.2	n/a	None	G50/SD40/C10

*S – submergent; E – emergent

** ST – silt; G – gravel; SD – sand; CO – cobble; C – clay; O – organic; B – boulder

Appendix 28. Continued.

August												
Site	Date	Air Temp. (°C)	Water Temp. (°C)	Cond. (µs)	Secchi Depth (m)	Stream Width (m)	Max Stream Depth (m)	Distance from Shore (m)	Max. Sampling Depth (m)	Flow Rate (riffle/run/pool)	Aquatic Vegetation (Type/%)	Substrate (Type%)*
1a+b	17/08/04	25.2	23.9	548	0.3	25.0	1.0	25.0	1.0	Medium (riffle)	None	SD35/G15/ C50
2a+b	17/08/04	25.6	22.5	633	0.35	35	0.8	35.0	0.8	Fast (riffle)	None	C40/SD30/G30
3a+b	17/08/04	26.7	23.7	612	0.3	25	1.5	25	1.5	Medium (run)	None	C60/SD20/ST10/G10
4a+b	17/08/04	26.4	22.7	632	0.33	20.0	0.75	20.0	0.75	Fast (riffle)	None	G60/SD20/C20
5a+b	19/08/04	15.9	20.8	667	0.23	25.0	1.2	25.0	1.2	Slow (run)	None	SD50/G35/C15
6a+b	19/08/04	19.7	21.9	604	0.25	20	1.5	0.25	1.5	Medium (run)	None	G60/SD20/G20
7a+b	19/08/04	23.0	22.4	621	0.31	25.0	1.0	25.0	1.0	Fast (riffle)	None	G40/B25/SD20/C15
8a+b	19/08/04	25.1	22.6	602	0.25	30	1.5	30.0	1.5	Fast (riffle)	None	G60/SD20/C15/B5
9a+b	18/08/04	21.8	22	632	0.25	20.0	2.0	20.0	2.0	Medium (run)	None	C40/SD30/G30
10a+b	18/08/04	23.2	22.4	645	0.28	20.0	1.2	20.0	1.2	Medium (run)	None	SD30/G30/C30/ST10
11a+b	18/08/04	26.1	22.3	629	0.3	25.0	1.5	1-5	1.1	Slow (run)	None	SD50/C40/ST10
12a+b	24/08/04	19.8	20.3	677	0.25	20.0	1.5	n/a	1.5	Slow (run)	None	n/a
13a+b	24/08/04	19.9	20.4	679	n/a	25.0	1.0	0	1.0	Medium (run)	none	SD50/C30/ST10/O10
14a+b	24/08/04	20.1	21.2	678	0.25	20.0	1.0	0	1.0	Slow (run)	None	G50/SD40/C10
15a+b	24/08/04	25.2	23.6	656	0.25	20.0	1.5	0	1.5	Medium (run)	none	SD50/C40/G10
16a+b	24/08/04	23.4	22.3	667	n/a	30	1.0	0	1.0	Slow (run)	None	G60/SD40
17a+b	24/08/04	26.7	23.7	665	0.22	30.0	1.5	0	0.5	Slow (run)	None	G40/C30/SD30
18	27/08/04	29.8	25.4	345	1.0	35	1.0	15.0	1.0	Slow (run)	None	SD60/ST40
19	27/08/04	26.2	23.0	360	n/a	50.0	1.0	15.0	0.5	Slow (run)	E 20	SD95/O5
20	27/08/04	26.1	23.2	356	1.2	40.0	1.2	4.0	1.2	Medium (riffle/run)	None	G80/SD20
21	27/08/04	25.3	23.6	358	n/a	n/a	n/a	n/a	n/a	Medium (run)	None	SD90/C5/O5
22	27/08/04	24.0	22.4	364	0.4	25.0	0.4	4.0	0.4	Fast (run)	None	SD80/G20
23	27/08/04	n/a	n/a	n/a	n/a	35.0	1.0	5.0	0.5	Medium (run)	None	SD50/G40/ST10
24	28/08/04	22.3	22.4	352	1.0	50.0	1.0	1-10	0.5	Slow (run)	None	SD50/G50
25	28/08/04	21.8	22.4	364	1.2	25.0	1.2	n/a	n/a	Medium (run)	None	SD75/C20/G5
26	28/08/04	21.6	22.4	365	1.8	30.0	1.8	1-3	0.8	Medium (run)	None	G50/SD40/ST10
27	28/08/04	22.3	22.4	362	n/a	20.0	1.5	3.0	1.5	Medium (run)	None	SD70/G30
28	28/08/04	21.6	23.3	359	n/a	25.0	1.5	3.0	0.5	Slow (run)	None	SD80/G15/ST5
29	28/08/04	26.2	24.2	356	n/a	n/a	n/a	n/a	n/a	Slow (pool)	E 10	ST40/C40/SD20
30	28/08/04	26.4	24.2	357	n/a	n/a	n/a	n/a	n/a	n/a	E 10	SD90/ST5/C5
31	28/08/04	24.2	23.7	360	n/a	n/a	n/a	n/a	n/a	Slow (run)	None	SD75/ST20/O5
32a+b	28/08/04	23.5	23.4	361	n/a	20.0	2.0	5.0	1.0	n/a	None	G50/SD40/C10

Appendix 28. Continued.

August												
Site	**Date**	**Air Temp. (°C)**	**Water Temp. (°C)**	**Cond. (µs)**	**Secchi Depth (m)**	**Stream Width (m)**	**Max Stream Depth (m)**	**Distance from Shore (m)**	**Max. Sampling Depth (m)**	**Flow Rate (riffle/run/pool)**	**Aquatic Vegetation (Type/%)***	**Substrate (Type%)****
33a+b	25/08/04	27.2	23.7	691	0.21	20.0	1.5	0	1.5	Medium (riffle/run)	None	SD80/ST10/G10
34a+b	26/08/04	n/a	n/a	n/a	n/a	25.0	1.5	25.0	1.5	Slow (run)	None	SD40/CO25/ST20/B15
35a+b	26/08/04	25.3	24.2	673	0.2	25.0	1.5	25.0	1.5	Slow (run)	None	ST60/SD20/G20
36a+b	26/08/04	25.5	23.4	685	n/a	25.0	2.0	25.0	2.0	Slow (run)	None	SD75/ST25
37a+b	26/08/04	23.1	23.8	684	0.22	40.0	2.0	40.0	1.5	Medium (riffle)	None	SD60/O20/G20
38a+b	26/08/04	26.8	25.0	337	n/a	n/a	n/a	n/a	n/a	Medium (riffle/run)	None	SD40/G40/ST20
39a+b	26/08/04	24.3	24.3	340	0.21	20	1.5	20.0	1.5	Slow (run)	None	SD100
40a+b	26/08/04	27.2	25.0	343	n/a	30.0	2.0	30.0	2.0	Slow (run)	None	SD45/G30/ST15/C10
41a+b	26/08/04	25.1	24.3	346	0.25	20.0	1.5	20.0	1.5	Slow (run)	None	SD60/ST40

*S – submergent; E – emergent

** ST – silt; G – gravel; SD – sand; CO – cobble; C – clay; O – organic; B – boulder

Appendix 28. Continued.

September												
Site	**Date**	**Air Temp. (°C)**	**Water Temp. (°C)**	**Cond. (µs)**	**Secchi Depth (m)**	**Stream Width (m)**	**Max Stream Depth (m)**	**Distance from Shore (m)**	**Max. Sampling Depth (m)**	**Flow Rate (riffle/run/pool)**	**Aquatic Vegetation (Type/%)***	**Substrate (Type%)****
1	21/09/04	21.3	17.4	720	0.3	70.0	1.75	40.0	0.6	Medium (riffle)	None	n/a
3	21/09/04	24.5	20.8	680	0.25	75.0	2.0	0	1.25	Slow (run)	None	C70/G30
4	21/09/04	24.0	19.0	720	0.23	40.0	2.2	0	1.5	Medium (riffle)	None	G60/SD40
5	21/09/04	23.0	19.4	730	0.2	50.0	2.0	0	1.25	Slow (run)	None	ST40/SD30/G30
6	21/09/04	20.1	19.4	740	0.18	50.0	2.0	0	1.25	Medium (riffle)	None	n/a
7	22/09/04	22.1	17.6	720	n/a	50.0	2.0	0	1.25	Medium (riffle/run)	None	CO25/C25/G25/SD25
8	22/09/04	23.5	17.7	730	0.2	30.0	1.5	0	0.75	Medium (n/a)	None	G60/SD20/CO20
9	22/09/04	25.5	18.7	720	0.2	30.0	2.0	0	1.5	Medium (run)	None	SD70/G30
10	22/09/04	23.4	19.1	720	0.2	30.0	2.5	0	1.5	Medium (run)	None	SD70/G15/ST15
11	22/09/04	n/a	20.7	730	0.2	30.0	2.0	0	1.25	Slow (run)	None	SD80/ST20
12	23/09/04	19.1	19.8	740	0.15	30.0	2.5	0	1.25	Slow (run)	None	SD70/ST30
13	23/09/04	24.1	20.3	720	0.15	40.0	1.75	5.0	1.25	Medium (riffle)	None	SD60/G20/SD20
14	23/09/04	n/a	19.9	740	0.15	30.0	2.0	0	1.25	Slow (run)	None	n/a
15	22/09/04	n/a	n/a	n/a	0.2	35.0	2.0	0	1.25	Slow (run)	None	SD60/ST20/G20
16	23/09/04	22.5	17.7	730	0.2	35.0	2.0	0	1.25	Medium (riffle)	None	SD60/G20/ST20
17	23/09/04	19.0	17.4	740	0.3	50.0	1.75	0	1.25	Medium (run)	None	C40/G30/CO20/SD10
18	28/09/04	11.4	17.0	760	>1	50.0	1.25	10.0	1.25	Slow (pool)	None	SD50/ST30/CO20
19	28/09/04	18.0	19.4	750	>1.25	70.0	2.0	10.0	1.25	Slow (run)	E 10	SD80/ST20
20	29/09/04	19.8	18.2	740	>1.25	30.0	2.5	10.0	1.25	Medium (run)	S 30	SD50/G30/CO20
21	29/09/04	11.5	15.8	760	0.75	50.0	1.5	10.0	1.25	Medium (run)	None	SD80/ST20
22	28/09/04	13.0	16.9	760	>1.25	40.0	1.75	10.0	1.25	Medium (riffle)	S 20	CO40/SD40/G20
23	28/09/04	16.9	19.5	740	>1.25	50.0	1.75	10.0	1.25	Slow (run)	None	G60/CO20/SD20
24	28/09/04	16.2	19.2	750	>1.25	50.0	2.0	10.0	1.25	Slow (run)	S 20	SD60/G40
25	29/09/04	19.0	18.2	750	>1.25	35.0	1.75	10.0	1.0	Medium (run)	S 60	SD70/G30
26	29/09/04	14.5	16.1	750	>1.25	50.0	2.0	10.0	1.0	Slow (riffle)	None	SD50/G40/ST10
27	05/10/04	n/a	n/a	n/a	>1.50	35.0	1.75	10.0	1.0	Medium (run)	S 10	SD70/G30
28	05/10/04	8.0	14.2	730	n/a	35.0	2.0	10.0	1.25	n/a	None	SD60/G20/ST20
29	06/10/04	12.1	12.3	750	>1.25	35.0	1.5	15.0	0.75	Medium (riffle)	S 5	SD60/ST20/B20
30	06/10/04	13.4	12.7	750	>1.25	50.0	0.75	15.0	0.75	Medium (riffle)	None	SD60/ST20/G20
31	06/10/04	14.1	12.7	750	>1.25	40.0	1.75	8.0	1.25	Medium (run)	None	SD80/ST10/G10
32	06/10/04	13.0	13.8	760	>1.25	35.0	2.0	10.0	1.25	Medium (run)	None	SD40/G40/CO20

*S- submergent; E – emergent

** ST – silt; G – gravel; SD – sand; CO – cobble; C – clay; O – organic; B – boulder

Appendix 29. Habitat data at Thames River tributary sites, 2004.

Site	Date	Air Temp (°C)	Water Temp (°C)	Cond. (µS)	Secchi Depth (m)	Stream Width (m)	Max Stream Depth (m)	Dist. From Shore (m)	Max Sampling Depth (m)	Flow Rate	Aquatic Vegetation Type (%)*	Substrate Type (%)**
1	19/08/04	21.7	22	500	0.1	33.1	1.6	9	1.1	Slow (run/pool)	None	ST(70)/G(30)
2	20/08/04	19.8	16.7	840	0.8	4	0.9	n/a	0.9	Medium (riffle/run)	None	SD(75)/G(20)/CO(5)
3	24/08/04	24.1	20.8	660	0.2	13	1.2	n/a	1.2	None (pool)	None	ST(50)/O(50)
4	24/08/04	25.7	14	870	0.4	2.5	0.4	n/a	0.4	Slow (run)	S(5)	C(75)/G(20)/SD(5)
5	24/08/04	24.7	23.5	540	0.15	6.0	0.75	n/a	0.75	None/slow (pool)	S(60)/E(15)	ST(95)/O(5)
6	25/08/04	23.3	20.3	790	0.9	3.75	1.1	n/a	1.1	None/Slow (pool)	None	C(75)/CO(15)/G(10)
7	25/08/04	23.8	22.7	820	0.5	13.0	0.5	n/a	0.5	None/Slow (pool)	E(40)/S(60)	O(60)/ST(40)
8a+b	25/08/04	29.7	26.3	830	0.6	1.5	0.6	n/a	0.6	Slow/Medium (Run/Pool)	S(70)/E(30)	ST(40)/G(30)/SD(20)/O(10)
9	26/08/04	22.5	20.7	750	0.6	3.5	0.6	n/a	0.6	Slow/Medium (Riffle/Run)	None	G(50)/SD(30)/C(20)
10	26/08/04	21.5	21.3	800	0.55	6.0	0.55	n/a	0.55	Slow (run/pool)	E(100)	O(100)
11	26/08/04	n/a	21.2	830	1.25	4.5	1.25	n/a	1.25	n/a	A(100)	SD(50)/CO(50)
12	30/08/04	23.5	21.5	670	0.25	3.0	1.2	n/a	1.2	n/a	E(100)	ST(60)/C(40)
13	30/08/04	20.9	21.1	600	0.2	3.0	0.8	0	0.8	Medium/Fast (riffle/run)	S(10)	O(65)/ST(25)/CO(10)
14	31/08/04	26.8	16.8	780	0.4	3.0	0.4	n/a	0.4	Slow (run/pool)	S(100)	O(40)/ST(35)/CO(25)
15	31/08/04	23.4	19.1	678	n/a	2.0	0.5	n/a	0.5	Slow (run)	E(80)/S(20)	O(80)/ST(20)
16	31/08/04	24.4	20.5	690	> 1.1	3.5	1.1	n/a	1.1	Slow/Medium (riffle/run)	A(100)	SD(40)/G(20)/C(20)/ST(20)
17	31/08/04	27.7	18.1	710	> 0.3	1.5	0.3	n/a	0.3	Slow/Medium (run)	n/a	SD(80)/O(20)
18	01/09/04	21.5	19.6	910	n/a	2.5	0.8	n/a	0.8	Slow (run)	None	SD(75)/Clay(20)/G(5)
19	01/09/04	22.3	17.5	600	n/a	1.5	0.4	n/a	0.4	Slow/Medium (run)	None	SD(100)
20	01/06/04	24.1	20.4	780	n/a	4.0	0.7	n/a	0.7	n/a	None	G(40)/SD(30)/C(30)
21	01/06/04	23.3	20.6	748	n/a	10.0	1.0	10.0	1.0	n/a	G(10)/S(5)	SD(50)/ST(30)/G(20)
22	01/06/04	26.0	22.5	759	n/a	15.0	1.5	10.0	1.5	n/a	S(20)/G(20)	ST(60)/C(20)/SD(20)
23	02/06/04	21.0	16.7	981	n/a	6.0	0.75	6.0	0.75	n/a	S(50)/G(10)	C(50)/ST(50)
24a+b	02/06/04	21.5	20.7	925	n/a	11.0	0.7	11.0	0.7	n/a	G(20)	SD(50)/ST(25)/G(25)
25	02/06/04	18.7	20.2	937	n/a	15.0	0.5	15.0	0.5	n/a	G(20)/S(10)	SD(50)/C(50)
26	02/06/04	18.1	17.0	978	n/a	6.0	1.0	6.0	1.0	n/a	S(60)/G(10)	C(60)/SD(30)/CO(10)
27	03/06/04	14.7	15.8	895	n/a	10.0	1.25	10.0	1.25	n/a	G(20)/S(20)	ST(60)/G(20)/CO(20)
28	03/06/04	19.5	17.2	853	n/a	3.0	n/a	n/a	n/a	Slow (run)	E(10)	ST(50)/G(25)/SD(25)

*S – submergent; E – emergent; G – grasses

**ST – silt; G – gravel; SD – sand; CO – cobble; C – clay; O – organic